School Shop

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SEPTEMBER 1959

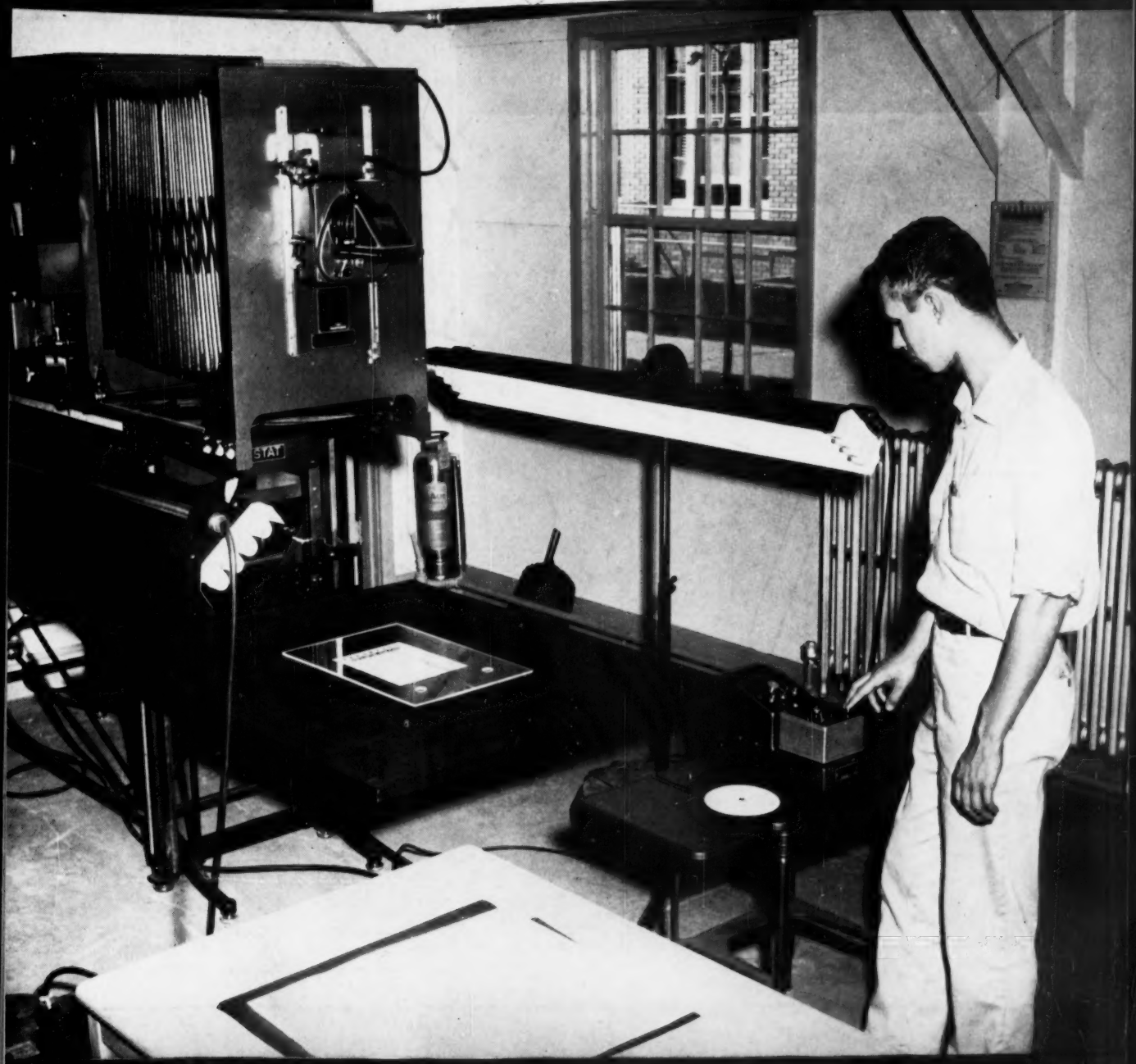
The Lamp
by Nathaniel Benchley

Trade-and-Industrial Education in College
by Fred W. Swan

Laminating, Bending Wood
by Warren Thomas

This is Wilbur!
by Gerald Maxwell

Cover Story: A visual reproduction technician trainee busy in a laboratory at Ferris Institute. For a report about this unusual college, please turn to page 13.



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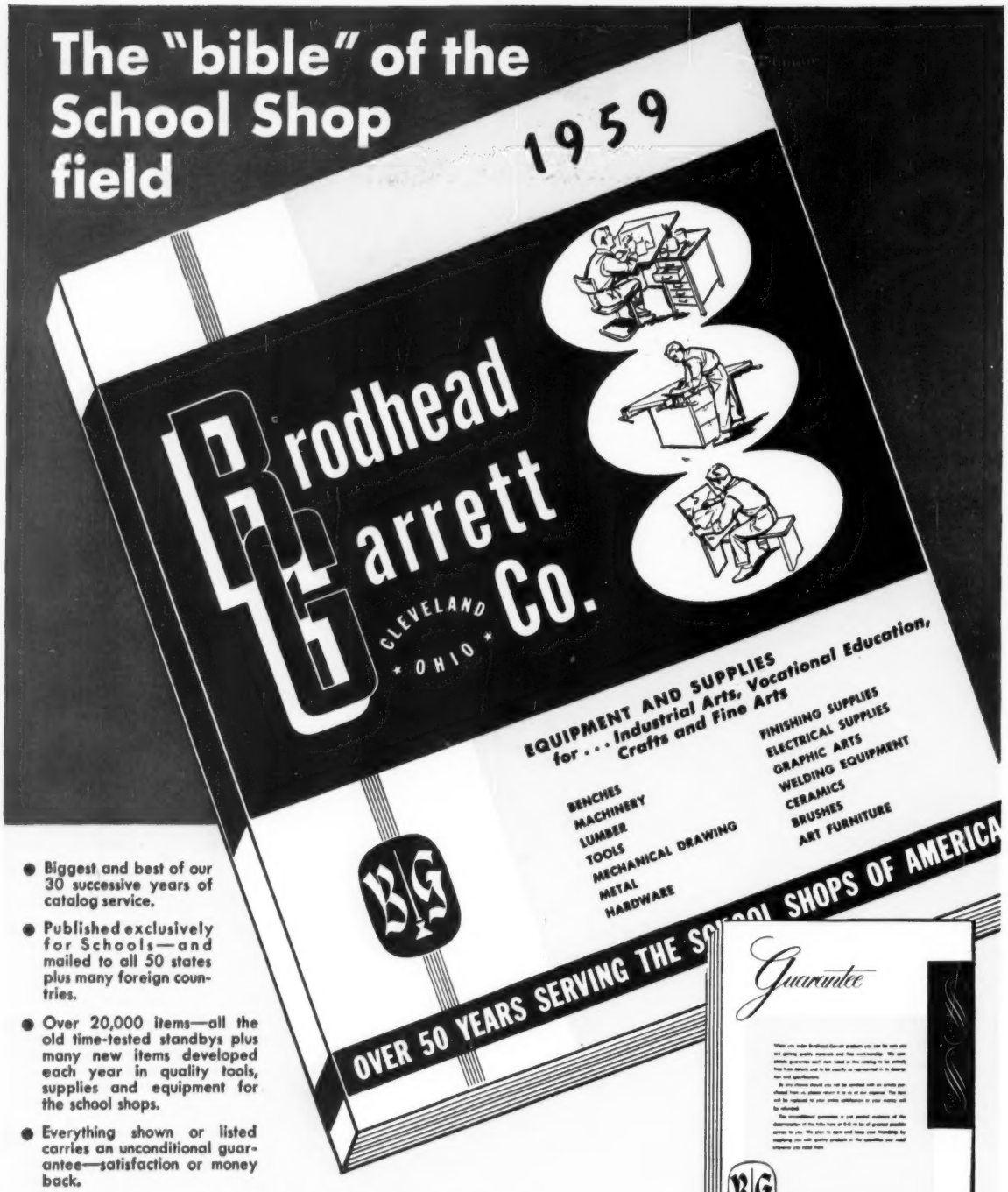

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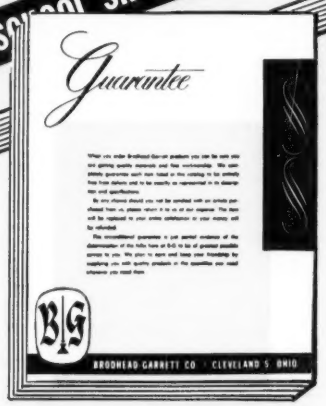

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School Shop TALK

COMMENTS ON ISSUES FACING INDUSTRIAL EDUCATION

Misconceptions Needing Correction

Recently a report was issued of an excellent study of trade-and-industrial education in the public high schools of California. This study was made last year and is based on discussions carried on by groups of individuals representing schools and industry.

One section is devoted to a consideration of the problems, identified by educators, that appear when trade-and-industrial education is offered in the public high school.

One of the eleven groups considering these problems was of the opinion that trade-and-industrial education has no place in the high school for a number of reasons, including the following:

1. Youth today are too immature to make sound vocational decisions while they are in school.

2. Youth cannot carry out vocational decisions until they have finished high school.

3. Youth will find jobs, even though they have no specific vocational preparation in the high schools and can learn the necessary skills on the job after employment without cost to public education.

Let's look at the first objection. It is surprising to learn that modern youth is less mature than the youth of yesteryear. We are of the opinion that youth today knows more about more things than their forefathers had any conception of. They are more mobile, have more opportunities to observe the world at work, and many are in the fortunate position of having guidance experts who do an excellent job of informing them concerning the requirements for, and the advantages and disadvantages of, various occupations.

The pronouncement that youth *cannot* fulfill their vocational choices until they have finished high school is obviously in error. They can and they do in many cases, even when they do not complete high school. And who can tell, at the beginning of a high-school year, how many such cases there are or who they are? Those who finished high school could have done it at any stage in their high-school careers, had they chosen to do so.

It is true that youth will find employment even if they have had no preparation for it in high school. It is true also that public education is freed from the cost of preparation, if it is not provided in the school. But the implication that the *public* is freed from the cost is false. It is agreed that preparation for effective employment costs money. When this is not provided in the school, the employer has to assume the responsibility for it. However, he adds this cost to the price of his product. Thus, the public has to pay for the training, if not in the school, then in what they pay for the products they purchase.

The group points out that the *major* responsibility of the high school is to provide a good general education. This may be true in general, but the question of whether or not it is the *only* responsibility is debatable. If the high school is for *all* youth of secondary-school age, then those who leave school and enter employment before completing the four-year course are entitled to just as much consideration as those who graduate. All youth should have as much general education as they can absorb but, at the same time, those who drop out are entitled to some preparation for the occupations they are likely to enter.

It is fortunate that these archaic ideas represent the attitude of only one group of the eleven who contributed to this section of the report. However, they are typical of many others whose restricted views on education cause them to think of our public high schools as being reserved exclusively for those who will eventually enter college. We have no quarrel with the idea that general education is desirable for all students and particularly for those bound for college. But we feel quite strongly that the vast army of youngsters who for any reason cannot afford or do not desire to attend college should have opportunities to prepare themselves for their life's work.—*T.D.*

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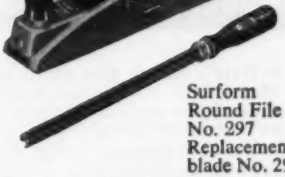

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(Brief comments about SCHOOL SHOP and the field it serves are invited. Address the Editor, SCHOOL SHOP, Ann Arbor, Michigan.

Dear Sir,

Here in Massachusetts, industrial arts seems to be some sort of orphan in general education. One reads about the Science Foundation Scholarships for mathematics, science, languages, and guidance. I'd like to have one in industrial arts. We certainly could use increased training. I mean summer studies and possibly industrial internships for teachers of industrial education.

Perhaps your magazine could help to foster such a move nationally.

Dana H. Prouty,
Ralph C. Mahar Regional High School,
Orange, Mass.

Dear Sir,

Your publication is one of the best teacher publications I have seen, and I get many of them for all teaching uses—in my related teaching as well as shop.

I just want to say that I favor 100 percent Mr. Larmon L. Smith's suggestion in the May issue of SCHOOL SHOP to publish a booklet or pamphlet containing the material published in your "Diamond Dust" columns.

John Hartig,
Tallmadge, Ohio

(*Editor's Note*: Mr. Hartig's letter is one of many we have received expressing approval of printing the "Diamond Dust" column in a booklet form. We have decided to adopt the suggestion, and the booklet is now being prepared for the printers. We shall let our readers know as soon as it is available.)

Dear Sir,

The articles concerning "The Technician and Industrial Education" appearing in the April 1959 issue of SCHOOL SHOP are extremely interesting and can be most beneficial in the training of technicians.

Is it possible to secure reprints of the various articles? If it is not possible to secure reprints of these articles, may we have permission to reproduce the various articles as needed, provided we give credit to SCHOOL SHOP and author?

S. R. Glenn,
State Supervisor,
Trade and Industrial Education,
Boise, Idaho.

(*Editor's Note*: Reprints of the lead article in the April issue by Brandon and Hawley and the articles by Twork and Nerden are available. Copies can be obtained from these authors. The other articles have not been reprinted, but we still have on hand a number of copies of this issue, available at 50c each or at discount rates in quantity.)

Dear Sir,

May I congratulate the editorial staff of SCHOOL SHOP for the excellent articles on technical education appearing in the April issue. The selection of areas, as well as the contents of each, was outstanding. We have found this issue most helpful in working with various groups concerned with technical education programs.

Fred R. Thornton,
Consultant, Technical Education,
State Department of Education,
Tallahassee, Fla.

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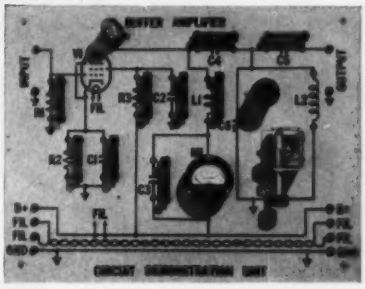

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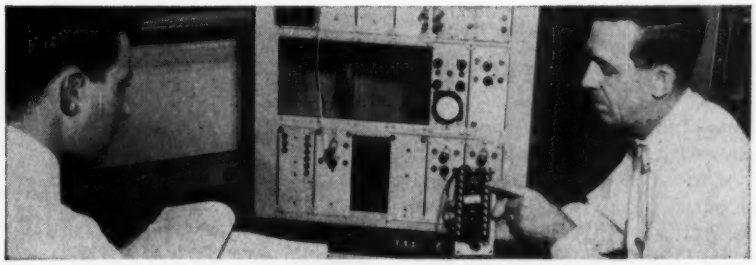

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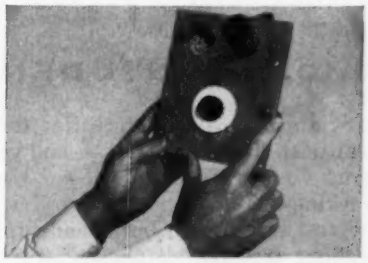

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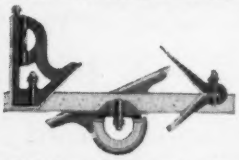

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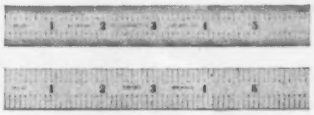

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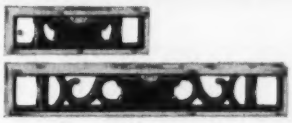

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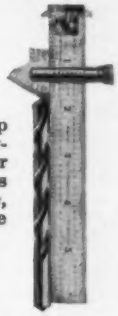

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THE LAMP

By Nathaniel Benchley

©1958 The New Yorker Magazine, Inc.

ARTHUR DOUGLAS took the afternoon newspaper into the library, switched on the green-shaded student lamp, and sat down in his comfortable brass-studded red leather chair. Before starting to read the paper, he looked around the room and experienced the warm glow of pleasure that it always gave him. It was a good room; it was restful and inviting, and the bookshelves that rose up three walls acted as a magnet—people always seemed to gravitate toward the books, and to take pleasure from them even without touching them. In fact, if the room had any drawback at all, it was that it was *too* appealing; it had originally been intended as Douglas's study, but it was so much more attractive than the living room that people congregated there, and it had finally been accepted that "Arthur's room" was where everybody went after dinner. Marie, his wife, often took her lunch in there, with the curious excuse that it was easier than eating it in the dining room or the kitchen.

Douglas had just opened his paper when he heard the front door of the apartment click open and slam shut, and then the unmistakable, rubber-heeled steps of David, their ten-year-old son, coming down the hall. In a moment, David was in the doorway, red-cheeked and with his hair plastered against his forehead by perspiration. He was holding in his hands a large, wobbling lamp.

"How do you like?" David asked, grinning. "It got first prize in shop!"

"Why, that's wonderful," said Douglas. "Let me see it."

David brought the lamp to him, and Douglas examined it in silence. The base was cylindrical, about twelve inches high and six inches wide. From a distance, it had appeared to be made of metal, but, looking at it closely, Douglas could see that it was wood that had been covered with aluminum foil. The foil was wrinkled, and in some places torn.

"I had an awful time with that foil," David said. "I had to use a special glue, and it kept sticking to everything, and then it would get all gooked up."

"I can see," said Douglas. "But you did a good job." He held the lamp at arm's length and looked at it, and the top section rattled. The shade, which was screwed to a lyre-shaped fixture bracketing the light bulb, was decorated with silhouette cutouts of ships and airplanes. "Did you do the shade, too?" Douglas asked.

"Well, sort of," David replied. "I didn't make *it*, but I made the decorations and put them on. But all the rest of it I made myself." He laughed. "Except, of course, the cord and the bulb and that bracket thing. Sir had those around the shop, and he told me how to put them on."

"Well, I think it's just fine," Douglas said. "I'm very proud of you." He handed the lamp back to David.

"No—you keep it," David said. "It's yours."

There was a short pause. "Oh, no," Douglas said. "I couldn't really. After all, you got the prize with it. You ought to keep it. But thank you anyway."

David took the lamp from him slowly, and held it for a moment before speaking. "I kind of made it with this room in mind," he said.

Douglas swallowed. "Well, I must say that's very nice of you, but look around—we haven't got *room* for any more lamps. Besides, it's too—too special to be used in here. I'm terribly flattered, but I'd feel wrong about accepting it. I really mean that."

David thought for a while. "O.K.," he said, and turned and went out of the room.

"Thank you anyway," Douglas called after him.

"O.K.," David said, from down the hall. He went into the kitchen, and Douglas could hear him as he showed the lamp to his mother.

Douglas opened his paper again, then put it down. He tried to remember all the things that David had made in school, and the uses to which they had been put after they were brought home. The first thing he had made was a pipe rack—a frame with holes drilled through the top and bottom, none of the holes being big enough to take any of Douglas's pipes. But he kept it on his desk for a while, and put pencils in it. Then there had been bookends, made of stained wood and having a jigsaw cutout of a bucking horse glued on each one; they were all

WHY "THE LAMP"

There are times when it is appropriate for a publication to veer slightly from its editorial formula—a quasi-sacred concept for any magazine.

After reading "The Lamp" when it first appeared in *The New Yorker*, the editors of *School Shop* decided that the story was cause enough to break with practice for a moment. Why? Because we feel Mr. Benchley has, in this delightful short story, delineated more carefully, more succinctly, and more accurately than any textbook the real meaning behind that traditional industrial-arts teaching device: the hallowed project.

We hope you enjoy the story and profit from it as much as we did.—*The Editors.*

right except that they weren't heavy enough to hold any but the smallest books in place. They were now in a closet, with the Christmas-tree ornaments. Next, there had been the mahogany-stained bowl, which David had made as a feed bowl for his dog, only to find out that it cracked when soaked in water. The crack had been glued together, and the bowl used to hold matches, but David had been angry and depressed. "The whole thing is a flop," he had said. "Nothing I ever make turns out to be any good."

I wish I'd been able to do something about that lamp, Douglas thought. But we *couldn't* have used it in this room, and if we just put it here for a couple of days, he would have felt worse when we gave it back to him than if we'd never taken it at all. If I can really make it seem that for him to have it is a reward—something he has won—maybe he'll feel better.

Douglas brooded about the matter through dinner, and then, when he and Marie were in the library with their coffee, he said, "I think I'm going to have a little talk with David."

She looked up from the needlepoint design she was sewing. "Why?" she asked, surprised, "What's he done?"

"He hasn't done anything wrong," Douglas said. "I mean about his lamp. I'm afraid I hurt his feelings when I told him we couldn't use it in here."

"Oh," she said, and went back to her needlepoint. "I didn't know he'd even thought of putting it in here."

"Yes. I hated to turn him down."

"Well, I don't think you need worry," she said. "He was gay as a grig when he brought it in to show to me."

"Still and all," Douglas said, rising, "I think a little talk won't do any harm."

David was in bed, with a stack of comic books in his lap. A portable radio, tuned not quite to a station, blared tinnily on a table on one side of his bed, and on the other side, next to the window, stood his lamp. It gave a brilliant light—Douglas estimated that there must be at least a hundred-and-fifty-watt bulb in it—and its glare threw long shadows into the corners of the room. The window curtain, stirred by a gust of wind, draped a filmy tentacle around the shade, and the lamp clattered and rocked slightly.

"Look out for that curtain," Douglas said. "It'll pull the lamp over if you're not careful."

David reached out and disengaged the curtain, then straightened the top of the lamp. "I've got to fix this tomorrow," he said. "She's come a little loose."

Douglas sat on the foot of the bed. "Look, David, there's something I'd like to talk to you about." he said. "Do you want to kill that music for a minute?"

David turned off the radio and looked at him questioningly, not knowing what to expect. "What?" he said.

"It's about the lamp," said Douglas. "It's a fine lamp, and I would like nothing better than to be able to use it in my—in the library."

He paused, and David continued to look at him.

"Now, here's what I'm getting at," Douglas went on. "Even if we *could* use it in the library, it would be wrong to, because it's something you worked very hard to do. It's something that you won first prize for, and it's something that belongs to you—that you ought to keep, like a medal. Do you see what I mean?"

"Oh, sure," said David. "I think you're right. I like to have it here." He looked at the lamp. "Do you notice how the foil shines in the light?" he asked.

Douglas looked, and saw that the light accentuated the wrinkles in the foil so they looked like raindrops running down a window. "Yes," he said. "It's very good-looking. And you'll be able to enjoy it in here. Do you see what I mean?"

"Oh, sure," said David. "I think it looks better here."

"Good," said Douglas, and he stood up. "I just wanted to make sure you understood, that's all."

"Oh, sure," David said, again.

Douglas rumpled the boy's hair, said good night to him, and went out. In the library, he picked up a magazine and sat down in his red chair. "I got it straightened out with no trouble at all," he said. "Everything's fine."

Marie didn't look up from her needlepoint. "Good," she said. "I'm glad."

It was sometime after midnight when Douglas was awakened by Marie. "Arthur!" she said loudly. "*Arthur!* Something's burning!"

He sat up, wide awake, and smelled a strong, rubbery odor of smoke. He swung out of bed, fumbled for his bedside light, and pressed the switch, but the light did not go on. "Turn on your light!" he said to Marie, and heard the clicking of her switch in the darkness.

"It won't go," she said.

"The goddam fuse is blown," he muttered. He stumbled across the room, stepping on his shoes and falling against the dressing table. "I'll bet it's that light of David's. I'll bet anything in the world. . . ."

He heard Marie behind him as he ran into the hall, groping through the darkness to David's room. He opened the door, and saw the window framed in the evil red glow of burning curtains. The smoke was thick and searing. "David!" he shouted. "David! Wake up!"

Marie screamed, and there was a rustling on David's bed, and then Douglas grabbed the boy blindly and picked him up and propelled him out of the room. "He's all right!" Douglas said. "Get some water from the kitchen!" Then he turned back, saw the lamp silhouetted in the glare, and ran and grabbed it by the top and flung it across the room. It burned his hand, but he felt it come apart and heard the plug come out of the wall socket, so he knew it could do no more damage. He took the blanket from the bed, and with it he pounded and ripped at the glowing remains of the curtains. Marie came into the room with a flashlight and a pitcher of water.

"Here," she said. "The light's on in the kitchen. David's getting more water."

Douglas poured the water on the curtains, and drenched them again with the water that David brought, and finally all that was left of the fire was the sour smell of smoke.

"What did it?" Marie asked, "Was it the lamp?"

"It certainly was," Douglas said. "God damn it, if they've got to make the kids build these things, I wish to Christ they'd show them how to do it *right!*" He was trembling, and his hand burned. "Come on," he said. "Let's go to the kitchen and get another fuse." As he and Marie started for the kitchen, he was aware that David was walking silently ahead of them.

Douglas put in a new fuse, and then they all went back, and he

(*Continued on page* 27)

How Ferris Institute offers

Trade-and-Industrial Education at the College Level

By Fred W. Swan

Acting Dean, Collegiate Technical Terminal Division, Ferris Institute, Big Rapids, Michigan

FERRIS INSTITUTE, a state college located at Big Rapids, Michigan, is generally recognized as having one of the fastest growing and most effective programs of trade-and-industrial education among collegiate institutions in the nation.

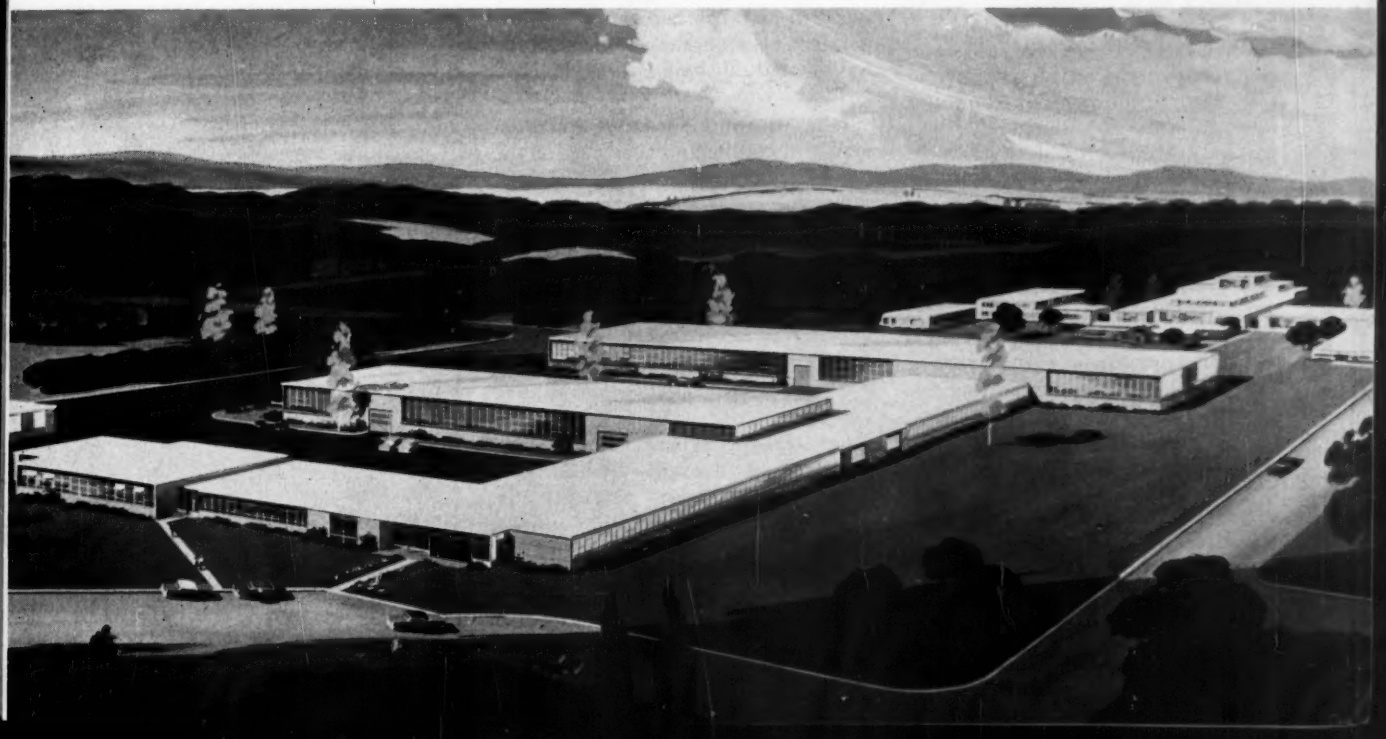
The formula for its success is simple: The student gets what he has always wanted — an intensive training which prepares him in the shortest possible time for the occupation he intends to follow as his life's work. Furthermore, industry gets what it has always wanted: an employe, well trained in modern methods, with modern equipment, and already familiar with applying his skills at an industry-accepted standard of competence.

Ferris Institute has put trade-and-industrial education high on the priority list of development activities to produce these results. A modern Trade and Industrial Center of 75,000 sq. ft., erected at a cost of $1,450,000, houses the majority of spacious, well equipped shop-laboratories and classrooms. A teaching staff, chosen with an objective eye on the practical industrial training to be offered, is composed of teachers with an abundance of recent industrial experience and technical knowledge. Physical equipment for training purposes is of the same type, size, and quality used in industry. Every effort is made to add new equipment to the shop-laboratories as soon as it has industry acceptance in its field. Often manufacturers cooperate with Ferris in supplying newly developed equipment to the school program before the majority of industrial establishments have included it in their operations.

These factors, plus others — that the program is offered in an attractive collegiate setting, that placement of graduates in industry is high, that the cost of a student's education is modest compared with many schools — has brought student enrolment to a new "high" each term.

The Trade and Industrial Division of Ferris Institute offers a variety of programs, whose scope represents both the traditional and newly developed fields of industrial training. Curriculums include training for automotive machinist, auto-body repair and

The Trade and Industrial Center at Ferris Institute. It has 75,000 sq. ft of laboratories and classrooms for industrial-vocational training.



The photos above show (top) part of the automotive-mechanics training department; and (bottom) a visual-reproductions technician trainee working in his lab. Ferris is a pioneer in visual-reproduction education.

painting, automotive service, machine drafting, architectural drafting, machine tool, general printing, printing supervision and management, refrigeration and air-conditioning service, heavy-equipment and diesel repair, visual-reproduction technician, radio-television service, transmitter service, and welding.

Ferris also offers other differentiated occupational training opportunities which, for purposes of administration and development, have been placed in instructional divisions of the college other than the Trade and Industrial Division. A Collegiate Technical Terminal Division offers surveying and topographical drawing, industrial chemistry, commercial art, environmental sanitation, dental office assistant, and physician's office assistant. Cosmetology is offered in the School of Applied Arts and Specialized Education.

The majority of trade-and-industrial programs are two-year training opportunities, offered in six 12-week quarters. The programs for automotive machinist and welding are shorter, and students complete these in 12 calendar months or four 12-week quarters. Ferris Institute conducts a summer school, and students can usually complete their programs in a shorter time by attending the summer session.

Several of the programs offer "options," which are opportunities for extended training. Radio-television servicing, for example, offers an additional 12-week term in color-television servicing, which is over and beyond the requirements for graduates of the regular program.

Other opportunities for additional training exist in printing, automotive servicing, transmitter servicing, and welding. In the printing program students who complete the two-year general-printing program may take two additional quarters of appropriate work to better equip them for supervision and management responsibilities in the printing field.

In the automotive-service program, the two-year graduate may take advanced work in auto testing, alignment and collision, or automatic-transmission service. Similar opportunities are available to students in transmitter servicing and welding.

School administrators and vocational educators readily recognize one of the major limitations to providing effective vocational training in their schools: that of offering extensive practical shop-laboratory experience to enable the student to acquire sufficient competency in manipulative skills for success on the job. Industry, too, is conscious of this fact, and sometimes critical that the graduate of a vocational-training program lacks speed in his work habits due to inexperience — even though he may be well versed in basic principles and technical know-how.

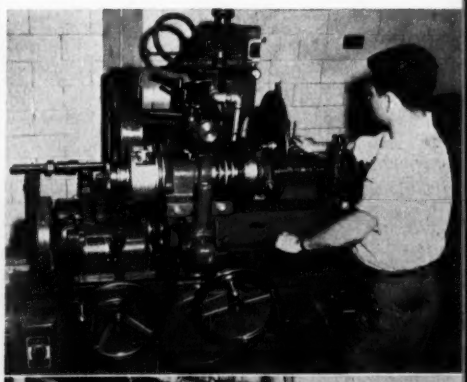
Ferris Institute has faced this problem realistically, and it is part of the school's philosophy that, insofar as it is possible, its graduates will be prepared to meet the industrial standards of achievement when they enter employment. To accomplish this, each student receives an amount of shop experience far in excess of that offered in most schools.

This is apparent when Ferris curriculums are compared with those of other schools. Whereas students in most college programs attend classes from 16 to 22 hours per week, the Ferris student in the Trade and Industrial Division spends 35 hours per week in shops and classrooms. These 35 hours are usually composed of 25 hours spent in study (shop and classroom) directly related to the occupation for which he is preparing; the remaining 10 hours are devoted to offerings in mathematics, physical science, social science, physical education, and other general-education subjects. On the average, the Ferris student spends 20 of the 25 hours per week devoted to his major interest in practical, productive experience in his shop-laboratory.

Industry has been alert to what Ferris Institute is doing to prepare students for many of the critical areas in the industrial field. The automotive programs at Ferris provide an excellent example of the support and cooperation industry will extend once it is "sold" on the effectiveness of good training. Equipment, training aids, and scholarships totaling many thousands of dollars have been contributed by manufacturers and suppliers of the automotive industry.

The Ferris program is a growing program. Each year since the Trade and Industrial Center was built, new programs have found their way into the curriculum. The 75,000 sq. ft. of the Center can no longer house all of its vocational-industrial offerings. Several programs are presently being conducted in temporary, supplementary buildings. The Ferris Institute

The photos below show (top) an automotive-machinist student learning to grind camshafts on the same type of specialized equipment used in industry; and (bottom) a refrigeration and air-conditioning student running a test in one of the labs at Ferris.



Board of Control, conscious of the growing need and demand for industrial training, has requested the Michigan Legislature for appropriations to construct additional shop buildings for present and future program needs.

In planning new vocational-training programs, Ferris Institute seeks to develop new training areas paralleling those of a basic core nature which it already has. This is evident in its recent developments. The automotive-machinist program is an offshoot of the college's automotive program and was developed at the insistence of industry in recognition of the critical need for trained personnel in automotive-engine rebuilding. Although several of the nation's schools provide training in some aspects of this occupation, Ferris Institute is in the forefront by offering a complete program.

Wheel alignment, collision, and frame straightening are other phases of the automotive-service field wherein there is critical need for training. These too are instructional specialties paralleling the basic automotive offerings. Manufacturers have cooperated with Ferris Institute in equipping a laboratory devoted to short-course training for automotive mechanics in the trade. The one-, two-, and three-week courses, operated during the past year, have attracted auto servicemen from more than half of the states in the nation, as well as representatives from Canada, Mexico, and the British West Indies.

The most recent occupational program added to the college's offerings is that for training the visual-reproduction technician. In this instance, Ferris Institute is a pioneer in a field whose importance, size, or rapid growth is realized by too few people. The industry encompasses such modern reproduction processes as diazotype and blueprint reproduction, photocopying, microfilming, offset duplicating, and electrostatic copying. In developing the nation's first formal training program in this field, the industry has given Ferris Institute unusual support. Not only has the reproduction industry supplied unlimited advisory assistance, but it has provided almost all of the industrial equipment required for teaching the reproduction processes.

Trade-and-industrial training is but one of the major instructional divisions of Ferris Institute. The college's instructional service program includes Divisions of Pharmacy, Commerce, General Education, Collegiate Technical Terminal, and a School of Applied Arts and Specialized Education. The latter includes a small high-school department whose primary function is to enable adults to complete high-school requirements or take subjects required for the college program in which they intend to enrol.

The total Ferris Institute program is conducted in a collegiate setting. Students in all programs have available to them the social, cultural, and recreational activities that characterize an active college campus. Intercollegiate competition is maintained in football, basketball, tennis, baseball, track, and golf.

The student enrolment at Ferris is more than 2,800 students, of which approximately 450 are in the Trade and Industrial Division. It is known as "Michigan's Most Distinctive College" not only because of the varied instructional programs it encom-

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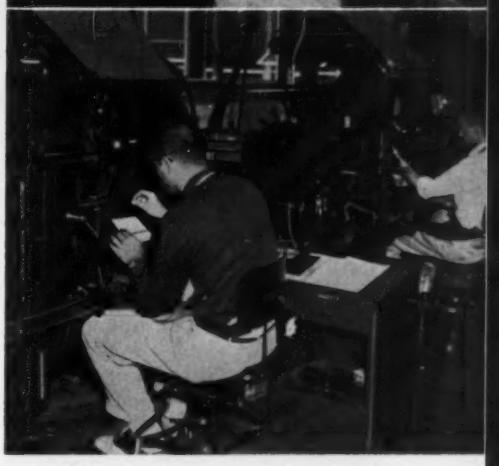
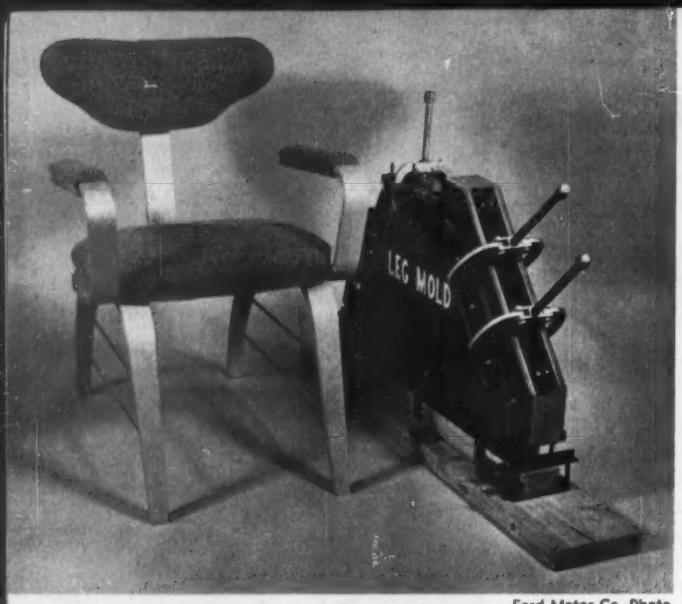


The photos above show (top) Ferris Institute T&I students repairing the manifold exhaust of a diesel-powered caterpillar tractor; and (bottom) a battery of linotype machines that are in use constantly in the graphic-arts department at Ferris Institute.

One of two radio-television laboratories at Ferris Institute's T&I Center. Each lab accommodates 20 students, each at his own bench.



Ford Motor Co. Photo

A chair (left) made from laminated and bent wood; and leg mold.

An opportunity for creativity

Laminating, Bending Wood for a Chair

By Warren Thomas

Wausau, Wisconsin, Senior-High School

LAMINATION may not fit into all industrial-arts programs, but some good reasons for attempting this method of construction follow:

1. It offers a different method for fabricating a product.
2. Members can be made much stronger with less weight and size.
3. It offers unlimited opportunities for creative design.
4. It offers a challenge for better — or advanced — students.
5. In many cases it saves on material.

This type of work may also be one of the answers for developing creative design and using the problem-solving method to meet the needs of better students in an industrial-arts program.

In creating a bent laminated chair as an original project in a woodworking class, Jim Wiederhoeft, a student at Senior-High School, Wausau, Wis., won the outstanding achievement award for design in the 1958 Ford Industrial Arts Awards.

Jim's project was a challenge to build a chair of original design, using the principle of bent laminated construction. Lamination is the process of gluing two or more pieces of wood with the grain running in the same direction. Bent lamination is the process of applying glue to the surface of two or more layers of wood, then placing them in a fixture that causes them to conform to a pre-determined curve, or curves, and applying pressure until the glue has set.

After a chair was selected as the project, many free-hand sketches were made in an attempt to create an acceptable design. From the drawings, a mock-up of the chair was made to study the over-all appearance and make necessary changes in design. For the mock-up, 1/16" welding rod was bent into the shape of the members and cardboard was taped to the welding rod to give a three-dimensional effect.

The next step in developing the chair was designing and building the molds to produce the desired results. This was one of the major problem-solving aspects in building the project. The type of molds, clamping methods, and type of material used for building molds will vary for different kinds of bends. Other factors may be the amount of money and type of equipment available for producing the molds in a school shop.

A male-female type mold was used for the back. Since much pressure had to be exerted on the mold during clamping, a hardwood was chosen. A Masonite pattern was made to design both sections of the mold.

In designing the male-female type mold, the two molds must be concentric to each other. This will depend on the number and thickness of the veneers used. It is important to have both sections of the mold machined very accurately to produce good glue joints on the glued member.

Because of the machine limitations in our shop, the molds were made in sections, shaped, and glued with aligning pins. Aligning bars were installed so the female mold would come down in the correct position on the male part of the mold.

Clamping bars, placed across the top of the mold, pulled the two sections together. Some type of press could also be used to apply pressure on the molds. A foam-rubber gasket

Leg mold and arm-and-back-support mold with their parts marked. Note clamping system.

was used to take up the small irregularities in the molds and veneers during the gluing process.

A different style mold was used for the legs, arms, and back support. For these members, molds with bands and cauls were used. The molds were built up of ¾" plywood and covered with Masonite. After the molds were cut on the bandsaw, they were accurately shaped on a large disc sander. Sections of the molds were cut out to allow room for the cauls and clamping. It was necessary to fasten hardwood bases to the molds to withstand the clamping pressure of the bands. A 28-gage stainless steel band was selected to pull the veneers around the mold. It is necessary to use some material such as stainless steel, which has a high tensile strength, because the pull on the band is very great. Wooden cauls were installed at the points where there was no pressure from the band. The cauls were made of oak, reinforced with steel straps. Wheel pullers were used to pull the cauls down on the veneers.

A urea resin glue, recommended for lamination, was used to glue all the members.

Another problem to be solved was distortion. The first members, after removal from the molds, distorted out of shape. All of the possible causes of distortion will not be listed here, but such things as arrangement of the grain pattern of the veneers, glue mixture, assembly periods, and length of curing were all factors that must be taken into consideration.

Shrinkage was also a problem. After the members were removed from the molds, they would become smaller. One of the causes seems to be the water in the glue, which effects the moisture content in the veneers during gluing and curing periods. The glue-water ratio was controlled as accurately as possible to the 1/10 of a gram to allow for equal shrinkage of all the members.

After the members were allowed to cure for approximately 24 hours, the glue squeeze-out was trimmed off with a saber saw and hand plane. Safety goggles were worn during the trimming operations because of the dan-

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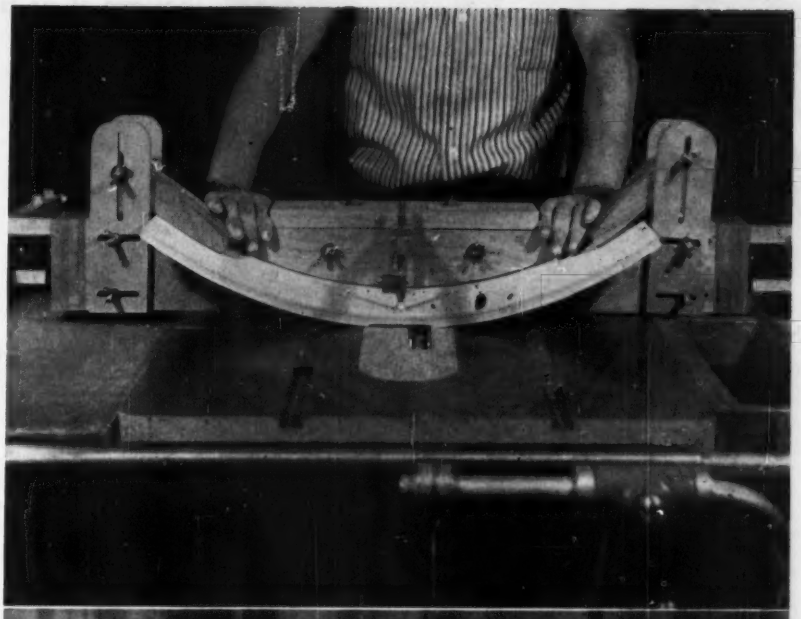
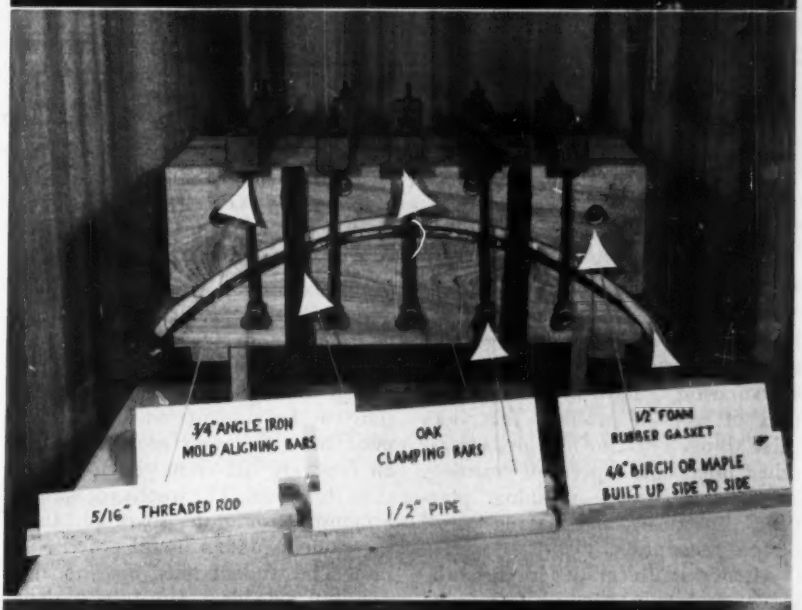
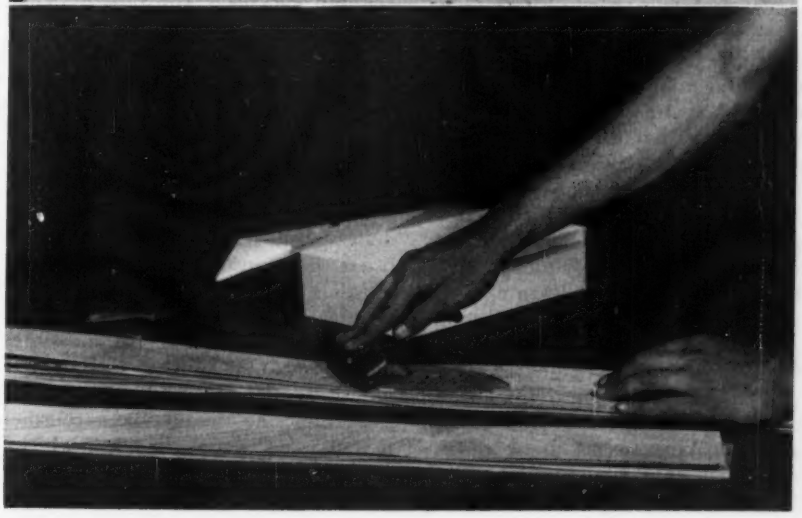






The pictures at right show (from top to bottom): Cutting the back dado with a special jig; a male-female type mold used for the back which requires accurate machining; applying glue with a rubber roller to provide a uniform coating for laminations.

Believe it or not, by gosh

This Is Wilbur! Aide to All Drafting Teachers

By Gerald R. Maxwell
Jefferson High School, Daly City, California

"Hi, folks! I'm Wilbur. I'm not much to look at, but then that depends on your point of view — or perspective. The students become quite fond of me. So do teachers when they get to know me."

WITH the feeling that mechanical drawing in high school has been limited to developing drafting skills such as lettering, line weight, and visualization, I have introduced as a unit of work a problem that does these things but also includes several other important aspects of learning. These are: creative thinking, planning, illustrating, and making use of design principles.

After a tenth-grade or eleventh-grade student has successfully completed all of the basic principles of drafting, namely the visualization of three-dimensional objects, the application of basic projections and sections, then what further is to be accomplished by repeating these problems, other than, of course, advancing these technical skills with harder problems? After the student understands the principle of the problem, how much additional learning takes place when he copies and solves the problem from the textbook? I have felt there is very little thinking taking place in this type of activity, and, in analyzing the average student, his main weakness seems to be the inability to think and plan.

To include other areas of learning in mechanical drawing, I have introduced a design problem that is used to stimulate the student and encourage creative thinking and planning. To do this I have presented a situation to the students in which they must solve a design problem under an entirely different environment than their own: The instructor creates a monster from outer space and then the students design useful objects for him. The student must *develop* and *plan* out *new* ideas. Since the student is designing under certain physical limitations which are new to him, he must use creative thinking to solve the problem.

I have developed a three-eyed, three-handed, three-legged monster. The students have named it "Wilbur." After having developed a scale drawing and scale model, and having listed the monster's physical characteristics, Wilbur is introduced to the class as a visitor from Mars. I discuss with the class the physical characteristics of Wilbur, such as his mouth at the top of his head, his three opposing thumbs, poor coordination, and poor eyesight, which ranges from 2 to 12 feet, with his three eyes placed in a 360° vantage point. Soon the students become interested in Wilbur's limitations and begin to discuss among themselves his physical actions and how he would perform certain basic functions like eating and walking.

At this point the problem is introduced to the students. The problem is to design and develop some useful object for Wilbur, and to draw a complete set of working drawings to depict the object. (It should be noted here that the students already have a fundamental understanding of basic drawing procedures, including various types of projection, etc., and a basic, though limited, knowledge of design principles, such as balance, function, etc.) The student may choose the object to be designed. However, the instructor must make sure that the student will be working on an object which will require the full capacity of the student and be a definite challenge to him.

The design must meet the physical limitations of Wilbur's manipulative skills. The student realizes that borrowing an idea which was designed to be used for a human purpose would not be practical for Wilbur. Therefore, the student must come up

with an original and workable idea.

He starts by making many sketches, working out as many ideas as he can and developing those that might become useful. The success of the design may depend on one single idea, such as a basic mechanical movement, the form of the object which Wilbur could manipulate, or an electrical solenoid to perform the function. This in itself becomes the most difficult part of the problem.

The student may spend from several days to a couple of weeks thinking and working out sketches for new ideas. When his basic ideas have evolved, he begins to draw his plans. The drawings include two or three views, sections and auxiliary views as needed, details and dimensions of each part—noting materials and processes used for construction—and a perspective illustration using shading. The problem usually includes from four to eight drawings and takes from four to six weeks to complete, with most of the time spent on thinking and working out basic ideas. In executing the drawings, the student must do research on his own to develop such things as an electrical circuit, or thread and gear specifications.

The complexity of the problem will depend on the ability of the individual student. Although the basic ideas used may not be original, they are brought to the attention of the student for the first time. On one occasion a "slow student" went to observe the actions of a dump truck to learn for the first time the application of a hydraulic piston. Some of the problems my students have completed are telephones, flashlights, furniture, appliances, tools, and a teaspoon, which in itself is a difficult design problem.

What has been accomplished by using this monster as a tool for learning? First, the student has become highly motivated through the use of his own imagination. With the student solving a design problem under basic physical limitations, he has learned to think and plan in a problem-solving situation. He has learned to do research and become aware of the technical processes which he is exposed to in everyday life. He has made use of the application of basic design principles and often realizes, for the first time, that form does follow function. The student has further developed his drafting skill, but more important he sees the application of various projections and drawing techniques and that each drawing is related to form a total working drawing.

Isn't there more learning taking place here than in copying and solving single problems from a standard mechanical-drawing text? ★

"Meet Wilbur. Shake Any of His Hands."

The following are the physical characteristics of Wilbur, a creature who lives on the planet Mars:

Body: egg shaped, brittle shell, round head at top of body.

Height: 3' 3".

Weight: 250 lbs.

Eyes: three placed to take in a 360° view, sight ranges from 2' to 12' distance.

Ear: one on the side of head, oblong, ½" x 3", excellent hearing.

Mouth: 2" in diameter, fixed at top of head, no moving jaw. Food is swallowed in a pulverized state.

Voice: squeaks in high pitch.

Hands: three hands with three opposing thumbs.

Lifting power: 1 lb.

Hand grip: 25 lbs.

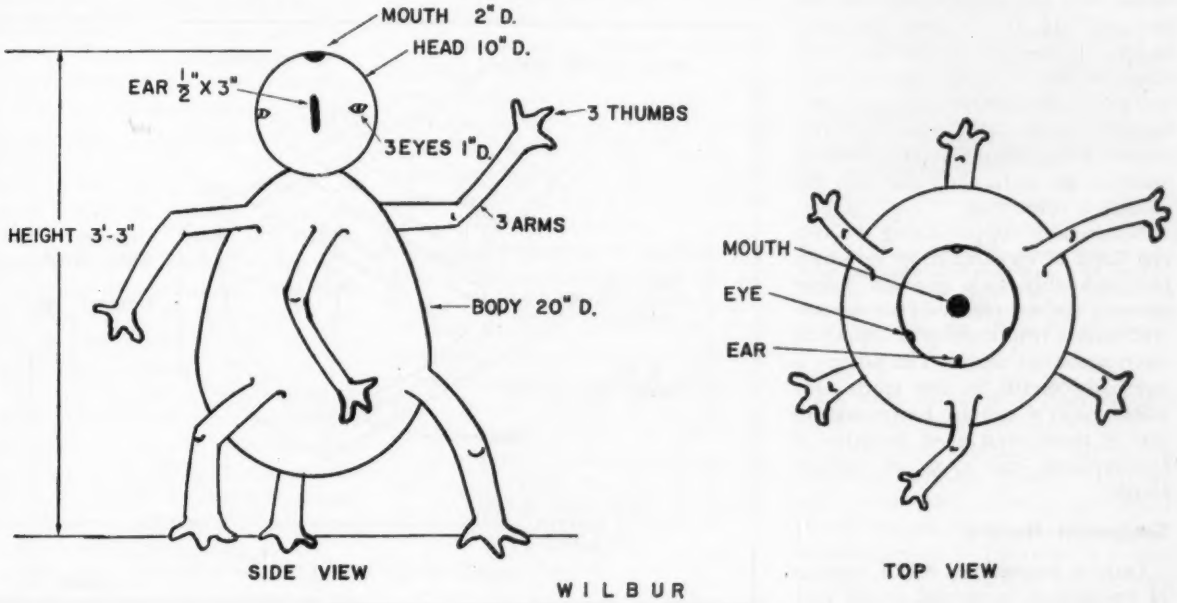
Coordination: poor, shaky, difficult to grasp objects, similar to a nine-month-old child.

Feet: three legs with three opposing toes.

Walking movement: ½ mph. in any direction, unable to climb.

Respiration: breathes oxygen through porous shell of body, exhales carbon dioxide through mouth.

Personality and intelligence: I.Q. of 175, good comprehension and ability to understand and solve most problems and situations with which he is confronted. However, it is difficult for him to do physical manipulations needed to execute the problem. Wilbur thinks in digits of three rather than even digits of two.



WILBUR

An incense burner made from plaster of Paris that has been copperplated by the technique described here. Copperplating makes this unique figure even more exotic.

Science takes on more meaning when you

Copperplate Nonmetallic Items in Your Shop

By Norman C. Pendered

Associate Professor of Industrial-Arts Education,
The Pennsylvania State University, University Park

ELECTROPLATING is a fascinating activity for the school shop. There is something magic-like in this process which always intrigues students — young and old alike. Many educational advantages accrue, too: Students can gain first-hand experiences with theories of electrolysis and electroplating. They can learn how to set up and operate simple plating equipment. They can study the uses of plating in the home and in industry.

Educationally, electroplating can contribute much to correlation among various shop activities as well as between shop and science programs. An electroplating area is useful not only in electric, sheetmetal, and art-metal shops of both unit and general type, but also in the general shop itself, particularly in the crafts area. It is with copperplating of nonmetallic objects made in the crafts shop that this discussion is concerned.

Nonmetallic copperplating is a special kind of electroplating in which nonconductors, such as wood, Keene cement, leather, plastics, etc., are covered with a thin coating of copper by electrochemical means. The process is especially useful in the crafts area where objects cast in Keene cement can be made even more beautiful if copperplated and given an antique finish.

Equipment Needed

Only a surprisingly small amount of equipment is needed to do nonmetallic copperplating. Any ingenious shop teacher can devise a satisfactory set-up using shop-made equipment. The major kinds of equipment and materials needed include: (1) a tank, (2) an electrolytic solution, (3) a source of direct current, (4) a rheostat, and (5) an ammeter. A typical hook-up is shown in Fig. 1. Descriptions of each of the aforementioned items follow:

Tanks. — The tank may be a glass jar, a crock of glazed earthenware, an old aquarium, or a storage-battery case. Good tanks can be made of wood. Wooden tanks, though, should be lined with tar or pitch. The following inside dimensions are satisfactory for tank size: length 14", width 8", height 10". This tank will hold approximately three gallons of solution and it is large enough to meet most plating needs in the school shop.

Solution. — The following solution will produce good copperplating results on nonmetallic objects: 5 pounds copper sulfate (blue vitriol); 12 ounces sulfuric acid; 1½ teaspoons corn syrup; and water to make 3 gallons.

Crush the copper sulphate crystals. Then dissolve them in about a gallon of hot water. Add the remainder of

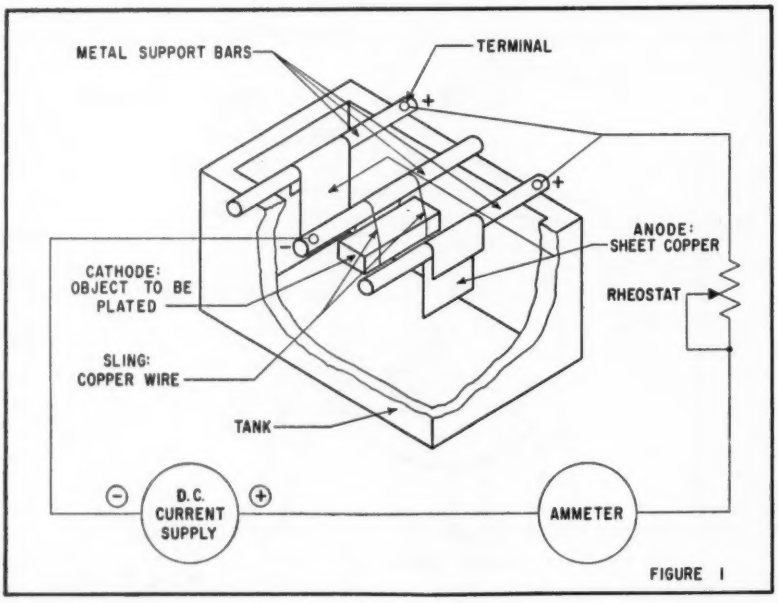


FIGURE 1

the water to make 3 gallons. Slowly add sulfuric *acid to water*. Stir in the corn syrup.

Current source. — Only direct current can be used for electroplating. Some good sources of direct current are a storage battery, a battery charger, a tungar-bulb rectifier, or a dry-plate rectifier. An automobile generator, driven by a small motor, makes an excellent source of current for electroplating. Also, certain transformer-rectifier units of the kind used on HO-gage model trains may be used.

Rheostat. — A rheostat is required in the circuit to control the amperage during plating. If a commercial rheostat is not available, the replacement element for a toaster may be used. A lead is connected to one end of the element with the other lead clipped on the element at whatever point is necessary to provide the proper resistance. Or, a rheostat can be made in the shop by wrapping 30′ of #22 nichrome wire around a sheet of mica mounted on a sheet of asbestos.

Ammeter. — An ammeter is a must in electroplating for two reasons: (*a*) The amperage required for a given job depends on the surface area of the work to be plated; (*b*) the amperage must be varied as the plating progresses. An ammeter with a range of 8 to 10 amps is satisfactory.

Preparing for Plating

Before nonmetallic objects can be copperplated, they must first be made to conduct electricity. This is easily done by spraying or brushing on a coat of a special bronzing solution consisting of: 1 ounce *cleaned* copper-bronze powder, ½ ounce clear lacquer, ½ ounce lacquer thinner.

The copper-bronze powder must be cleaned chemically before it can be used. If this is not done, satisfactory plating cannot be expected. To do this cleaning place the powder in a small bottle of acetone. Shake the bottle vigorously. Allow the bottle's contents to settle in a flat pan or dish, then pour off the acetone. The powder that remains should be clean and free of the grease that previously coated each particle.

The ingredients in the bronzing solution must be measured carefully. If too much lacquer is used, the conducting quality of the bronze powder will be impaired. If too much thinner is used, the bronze powder may tend to flake off during plating.

After the work has been coated with copper-bronze paint, it must not be allowed to become dirty or oily before plating. Even handling the work with bare hands should be avoided. The work should be inspected, however, after the copper bronzing has been applied. When the work is dry, a finger touched to the surface should show some copper-bronze powder. If none shows, then either too much lacquer or not enough lacquer thinner was used.

The work to be plated should now be suspended in a sling of fine copper wire. It will be connected to the cathode (negative) side of the line when it is immersed in the plating solution.

Plating Suggestions

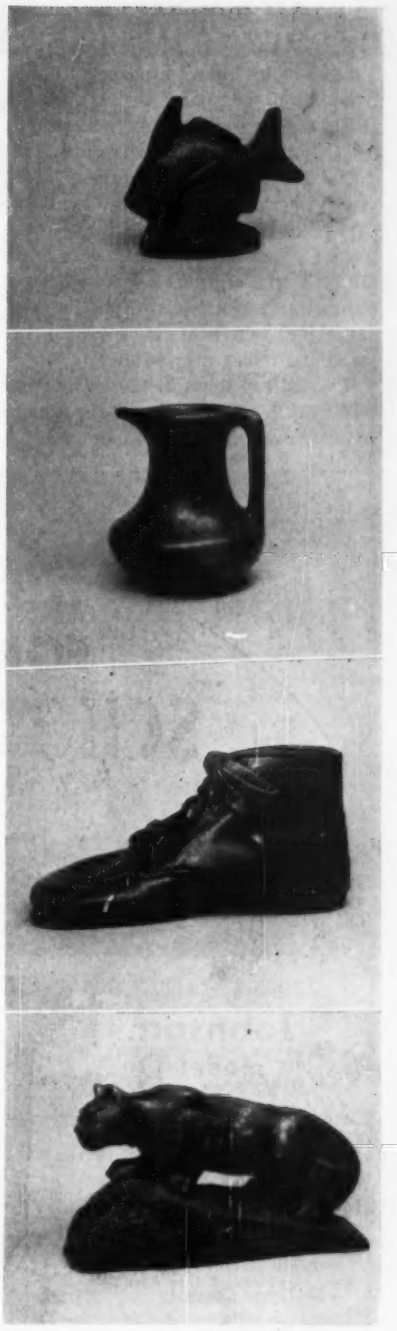
All connections should be made, and the current turned on, before the work to be plated is immersed in the plating solution. If the work is suspended in the solution while the current is off, the results may prove unsatisfactory. Even when the work is being inspected during plating, it should be withdrawn while the current is flowing in the circuit. In nonmetallic plating, it is good practice to have the electroplating going on — that is, actually depositing metal on a "false" cathode — before the work to be plated is immersed in the solution. The "false" cathode can be a strip of tin or other suitable metal. Its purpose is to get the plating started promptly. Otherwise, the work may hang suspended in the solution before it begins to plate and during this time partial disintegration can even take place. After the work has begun to plate properly, the "false" electrode should be removed.

The amperage required for electroplating depends on the area of work to be plated. A rule of thumb is: Allow one amp for each 10 square inches of surface to be plated. To get the plating started promptly, it is a good idea during the first 5 to 10 minutes of plating to double the amperage that normally would be required. Following this beginning period, the amperage should be cut back to normal. In other words, if the area of the work requires 2 amperes for proper plating, 4 amperes should be used during the first 5 to 10 minutes of plating, or until the work begins to take on a pinkish glow, indicating that plating has begun. Then the current should be reduced to 2 amperes for the remainder of plating time.

Color Guide

If plating proceeds properly, the work soon takes on a light reddish color. After 15 to 20 minutes of plating, the work should be withdrawn from the solution (current left on) and inspected. The proper color should be, of course, a bright tinge of new copper. If the color is a dark pink, the work should be washed with

(*Continued on page* 46)



Each of these figures is made from a material not generally associated with copper-plating. The fish (from top to bottom) is ceramic; the pitcher is glass; the baby shoe is leather; and the cat is Keene cement.

Ford IAA Winners

THIRTY-TWO boys, ranging in age from 12 to 18, were winners of the 1959 Outstanding Achievement Awards in the thirteenth annual Industrial Arts Awards contest sponsored by the Ford Motor Company.

Nine of the top award winners were from California and four were from Ohio. Three winners each were from Illinois and North Carolina. Pennsylvania had two winners. Eleven other states each had one winner.

The 32 top winners, and 639 other cash-award winners in the competition, will share approximately $50,000 in cash prizes. The winning projects made by these boys were selected from more than 4,000 entries sent to Detroit this summer for final judging. The 4,000 entries, in turn, were winners of 75 local and regional contests last spring in which approximately 45,000 projects were entered.

In addition to their regular cash prizes, the 32 winners of Outstanding Achievement Awards, along with their instructors, will be guests of Ford Motor Company for an all-expense-paid, three-day visit to Dearborn, Mich., Oct. 1-3. These winners, their projects, and instructors, were:

Ceramics: Howard Ziegler, 16, La Mesa, Calif., stoneware cookie jar — Larry Helmuth, instructor; Walter Allen Babel, 15, Philadelphia, Pa., two bottles, vase, and molds — Robert Fluhr, instructor.

Architectural Drawing: William J. Plummer, 17, Champaign, Ill., working drawings — Robert Bokenkamp, instructor; Ken Peterson, 17, Chicago, Ill., contemporary design for a residence — Kenneth G. Peterson, instructor; Joe Kobylecky, 17, Chicago, architectural scale model — T. Hunter, instructor.

Electricity: Don Brown, 12, Los Angeles, Calif., intercommunication master — John Edwards, instructor; Toby Chess, 13, Los Angeles, Calif., experimenter's power supply — J. Harvey Seiple, instructor; Steven A. White, 17, Oakland, Calif., model of light-seeking rocket — Nicholas Saba, instructor; Ritchie Sidener, 16, Wichita, Kan., working-model rocket — L. C. Bork, instructor; Robert Litz, 18, St. Paul, Minn., a-c arc welder — Curtis Johnson, instructor; Jim Beeman, 18, Seville, Ohio, transistorized dual-proportional control for model plane — Wendell R. Hostetler, instructor.

Leathercraft: Don Johnson, 16, Oklahoma City, Okla., saddle, bridle, and breast collar —Mary Nokes, instructor.

Machine Shop: Harold Schmid, 17, Nutley, N. J., gavel with form tools and lathe tracer — Bruno F. Piefke, instructor; Robert Holloway, 16, Dayton, Ohio, 12" vernier height gage — Theodore Wiley, instructor; Ronald Ray Underwood, 18, Charleston, W. Va., permanent molds for aluminum engine castings — M. D. Harper, instructor.

Mechanical Drawing: James A. Moschenross, 18, Burbank, Calif., four presentations of an engine — Ronald Gaitskell, instructor; Hal Johnson, 16, Long Beach, Calif., drawings on "Story of the Valve" — Arthur F. Steiner, instructor; Bill L. Paulin, 16, Ontario, Calif., drawings of lathe transmission box — Kenneth R. Stark, instructor.

Models: Rex Patrick, 15, Roanoke, Va., cap and ball pistol — Clyde C. Caldwell, instructor.

Open: David Hlavsa, 18, Cleveland, Ohio, garden tractor with hydraulic lift and snow plow — Robert W. Fricker, instructor.

Pattern Making and Molding: Ronald I. Otto, 18, Milwaukee, Wis., valve chest for steam turbine — H. E. Ohly, Jr., instructor.

Woodworking: Arnold Gonier, 18, Brockton, Mass., French provincial breakfront — Donald O. Drew, instructor; Eddie Holden Clodfelter, 13, Randelman, N. C., Jenny Lind bed — David A. Rigsby, instructor; Joe Griffin, 13, Greensboro, N. C., pair of bachelor chests — David A. Rigsby, instructor; Steve Rubin, 14, Greensboro, N. C., tambour secretary — David A. Rigsby, instructor; Ed Kutzner, 16, Cheltenham, Pa., love seat — Richard Hoptner, instructor; John Boyd, 13, Snyder, Tex., violin with case and bow — Joe T. Harwell, instructor.

Wrought Metal: Mark D. Johansen, 14, Redwood City, Calif., aluminum ware — E. B. Mattson, instructor; Walter Clark, 16, Redwood City, Calif., dining room table and four chairs — Richard J. Herzing, instructor; Louis Szuba, 17, Parma, Ohio, set of table, coffee table, four chairs, and chaise longue — Robert W. Fricker, instructor; Steve Paolo, 15, Milwaukie, Ore., tea server, Archie M. Timmons, instructor; Alan Howard Perry, 17, Washington, D. C., sterling silver pitcher — Rufus Jacoby, instructor.

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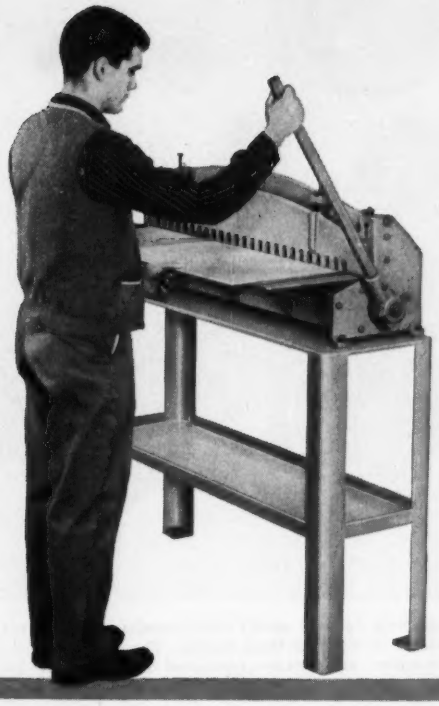

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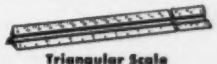

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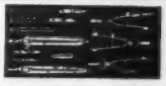

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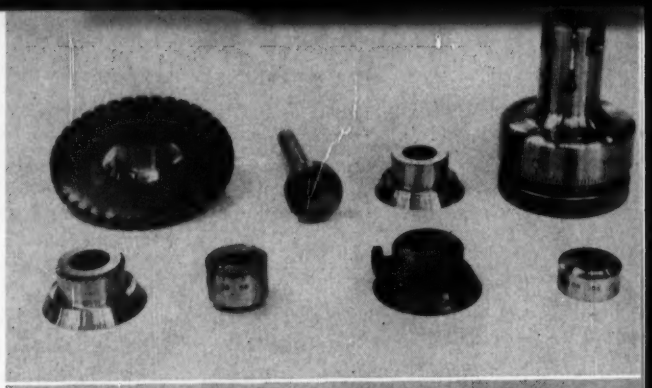
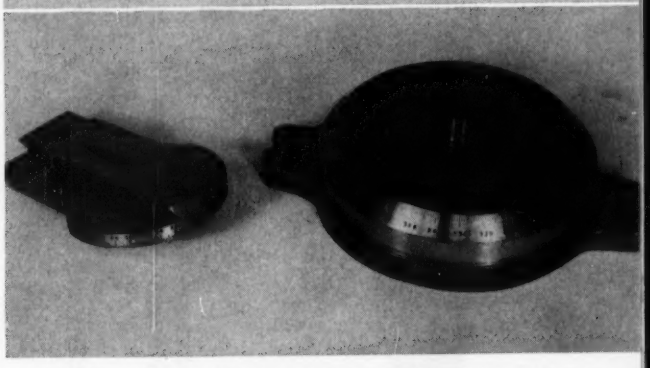
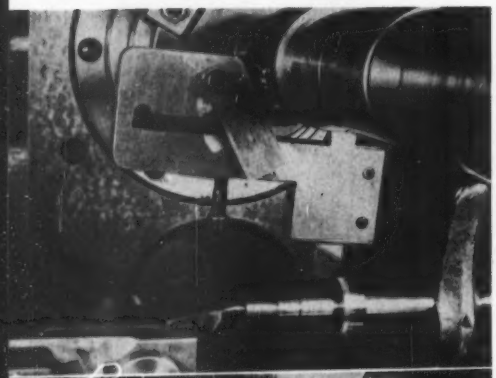
By H. J. Gerber

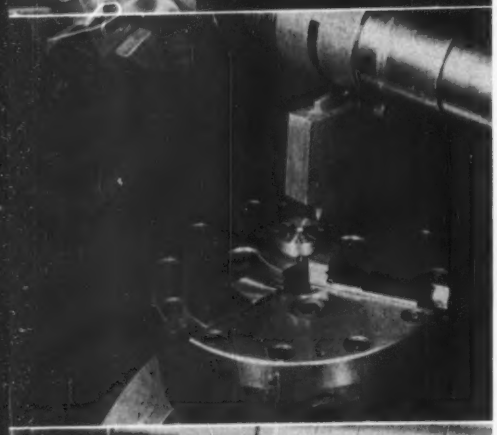
Head, Machine-Shop Department, The Technical Institute, Oklahoma State University, Stillwater

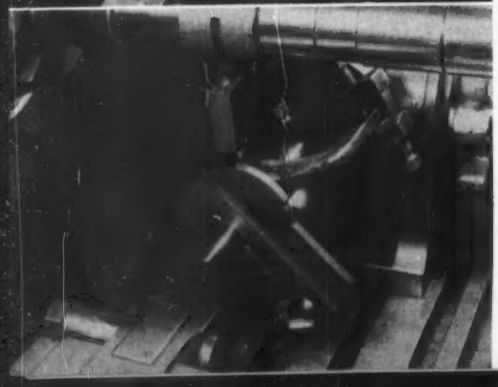




The top photo (above) shows some circular machine dials graduated by students in machine-shop classes. The bottom photo shows two large machine components graduated in degree-of-angle units.







SCHOOL machine-shop programs often include small machine tools or instruments that require accurately graduated scales or dials. In my advanced classes we have been confronted by this problem. To solve this problem we have developed a number of tool designs and procedures. The results have been accurate and thoroughly professional in appearance. Repeatedly they have been pleasantly mistaken as commercially produced.

Examples of these tools and methods are shown here. They are all student developed.

Scale and dial marking usually involves two separate procedures: precision spacing, linear or circular, of equally spaced and cleanly cut graduation marks in quantities of fractions of an inch, decimals of an inch, or degrees of angle; and number marking of the graduations so they are neat, uniform, and readable.

It is obvious that a school-shop program, despite toolroom-type equipment, would not generally include the special graduating machines, indenting dies, numbering machines, etc., found in a production plant doing this sort of work. A compromise can be reached, though, with simple attachments, jigs, and fixtures, such as those shown on these three pages.

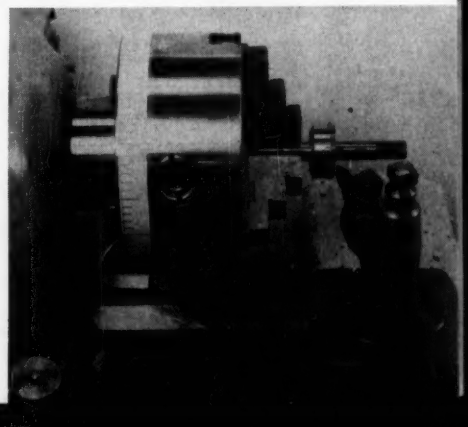
Three Techniques . . .

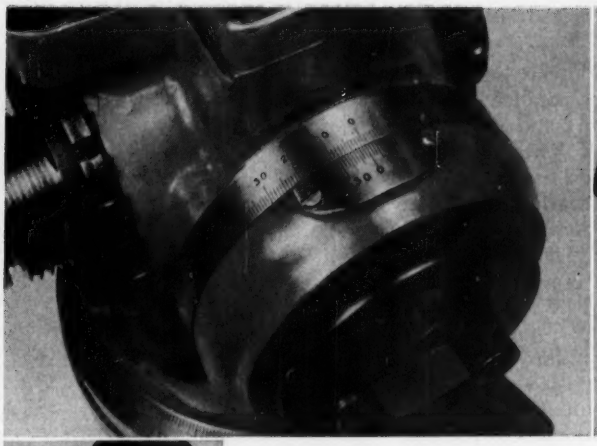
The three photos at left show the following: An elementary method for graduating any circular dial (top photo). The work is held between centers of a dividing head mounted on a horizontal milling machine. The cutter is held stationary on the arbor by a holder with an adjustable amount of springback to protect the cutter's point.

To cut graduations on the face of a lathe chasing dial, chuck the work (center photo) in the dividing head with its axis in a vertical position.

A reamed hole in the work (bottom photo) provides a center of rotation for machining angle-division graduations on a lathe-compound base.

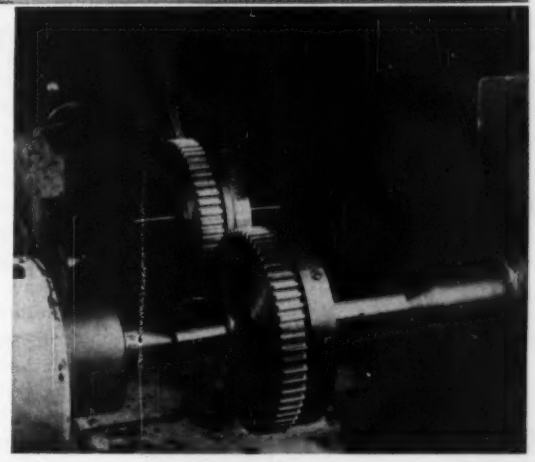
The photo below shows an accurately spaced tape wrapped around the body of a chuck. A surface gage (left) locates each marking position. Corresponding markings are made in the work by a tool held in the lathe post (right). The scriber's on a magnetic indicator base seated against the headstock.





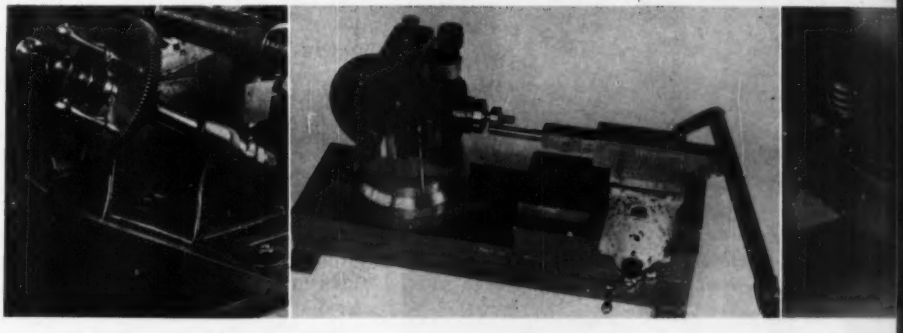
Vernier Scale . . .

Above right are components for graduating a vernier scale attached to the knee casting of the body-tilt scale of a universal dividing head (above left). At right the vernier is being graduated in increments of five-minute angles. The tool-steel indenting roller (left) is connected to the work mandrel by gearing that assures positive and accurate transfer of spacings. Graduations in the indenting tool—made of nondeforming tool steel—were spaced and cut by a differential indexing setup in the milling machine.

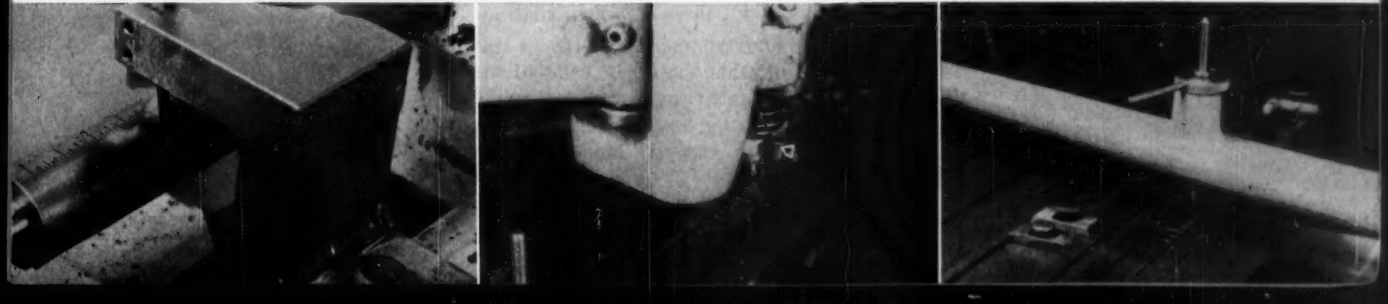


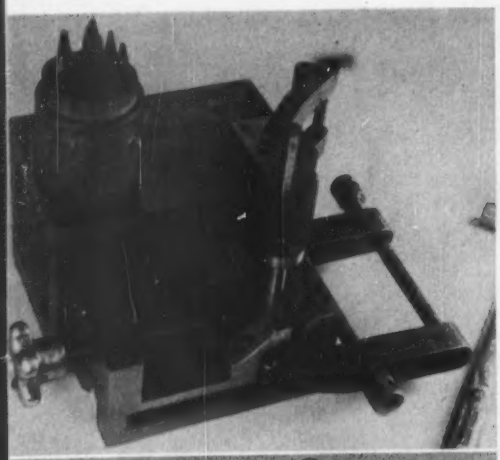
There are angles . . .

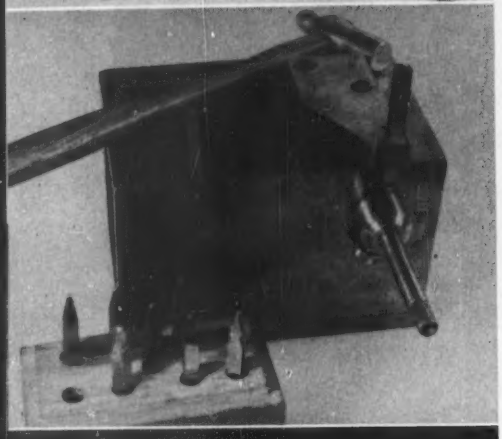
Starting from the left (at right) is a direct, master index plate for indexing and cutting 125 equal divisions on angular-faced dials using a spring-loaded detent plunger for each division. Lines on the plate's face show medium and long lines to be cut. Lengths are controlled by table-feed screw of the milling machine. Graduating a dial face (center at right) with a special, bench-mounted machine. Divisions are cranked out through a dividing head. The hand-operated cutter ram is a small lathe key-seating attachment seated on an engine-lathe compound slide attached to the weldment base. The rotary adjustable stop (right) is on the underside of the hand-operated cutter ram. It regulates lengths of cuts.

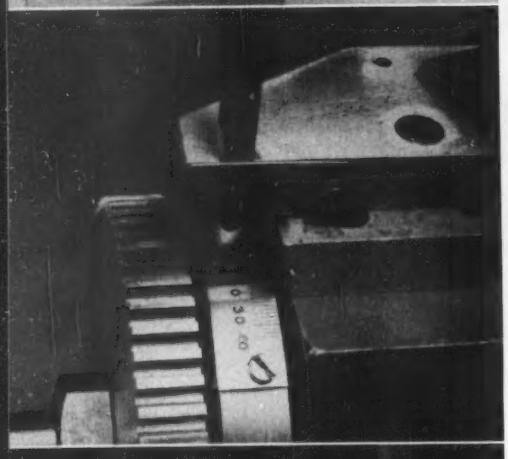


The tailstock spindle (below left) of an engine lathe is being graduated in units of 1/16″ by an overshot tool holder with spacing through the graduations on the micrometer dial of the compound. Controlled movement of the lathe's cross slide makes the cuts. At far right, a steel rule on the copy table of a pantograph milling machine guides duplication of its divisions on a link bar (center photo). A sharp, high-speed rotary cutter is used.









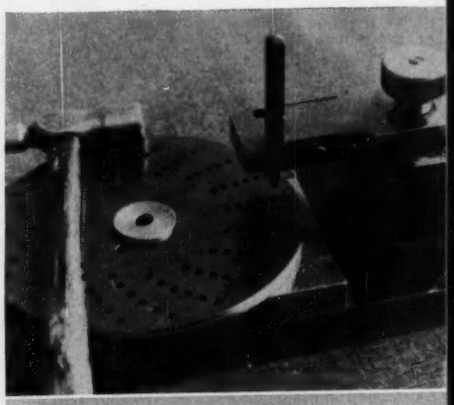
Numbering . . .

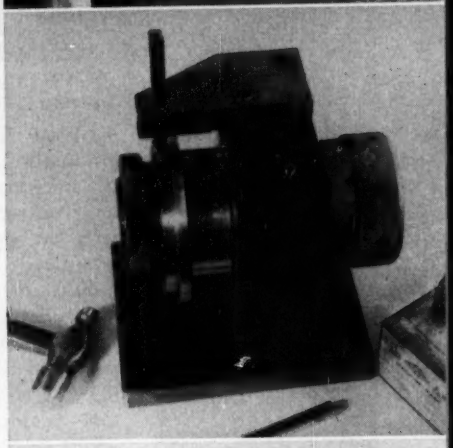
Standard tooling items, such as a toolmaker's vise, box parallel, etc., can combine to hold work and guide steel numbering stamps. The photos at either side show their use. Starting at the left, a lathe chasing dial (top photo) is held in a small vise clamped to a box parallel. The steel stamps have been surface ground to fit the slot in the guide bar. A flat spring keeps the stamp in the slot. A similar setup (second from top) is used to number graduations on a small lathe-dial collar. The guide bar has been semipermanently attached to the box with screws and dowel pins. The gear and shaft, part of the roll-marking device for graduating a vernier scale, is fitted (third from the top) into a hole in the box parallel to support the work as it is numbered. To number the graduations on a lathe-compound base (bottom photo) the same box-parallel jig is used.

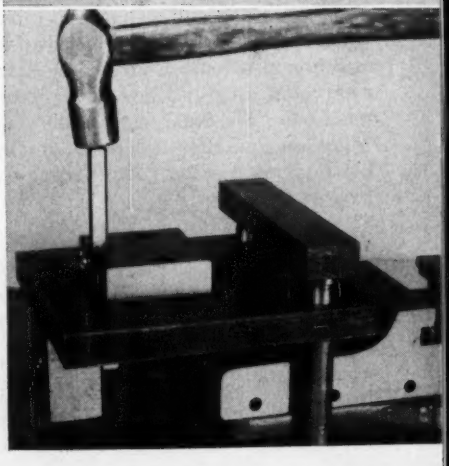
The photos at right show some more ways to number graduations. To number the dividing plate (top photo), you will note the plate is mounted on a sliding stud for positioning each row of holes. The stamp holder has seating slots for two stamps and is moved sideways for alignment of each digit. This alignment is determined by fingernail check on gaging surfaces on outer corners of stamp holders. A special numbering jig (second from top) is for marking locations on the direct-index plates of the dividing head. A rotating-arm-type of jig (third from top) is used for holding the number stamps in position while marking dividing-base-head graduations. A stamp-alignment jig (bottom photo) locates the single-index mark that matches the micrometer-dial collar on the lathe compound. This jig locates itself by means of a stud seating in the screw-bearing sleeve of the compound slide. The assembly is seated on a surface plate so that the sliding equalizer can locate the exact top position for the index mark.

We have used these techniques with what we consider to be fairly successful results. You, too, should be able to adapt them to your situation.

One final comment, and it's an emphasis of what should be selfevident: Sloppy number marking seriously jeopardizes the *function,* and *appearance,* of an expertly made scale or dial. ★







The Lamp . . . *from page 12*

flicked on the overhead light in David's room. The ceiling above the window was blackened, and the paint on the frame had dark-brown bubbles in it, but beyond that there was little damage. Across the room, where Douglas had thrown it, was the lamp. The shade was burned, and the top section had come off, but the base was more or less intact. Douglas picked it up and examined it, and something heavy rattled inside. He looked at David: "What's that?" he asked. "What's in there?"

"A pipe," David said tonelessly "The wire ran through it."

Douglas saw that the top of the base was seared and black, and that the light cord, which had fallen out, was fused together at the end. He deduced that the connection had come loose up by the bulb and that the wires had worked together and made a short circuit.

There was a silence, and then David picked up the charred remains of the shade and looked at it. "I guess it's just another flop," he said "I'm sorry."

"*You* have nothing to apologize for," Douglas said. He cleared his throat. "I'm the one who should be sorry. I didn't mean to shout like that."

David shrugged. "I guess you were right, anyway," he said.

"Look," said Douglas. "It isn't as bad as all that. It just worked loose." David shrugged again, and Douglas went on, "I'll tell what we'll do. Tomorrow, we'll take it to the electrical store and we'll get the man there to make a really tight connection for it. Then we'll get a new shade, and put some more decorations on it, and the whole thing'll be just as good as ever. Better, even. How about that?"

David thought for a while, and then again he shrugged. "O.K.," he said, and climbed into bed.

The next day was Saturday. After breakfast, Douglas took the remains of the shade off the bracket, and, David carrying the base and Douglas carrying the top assembly and the cord, they went to the electrical store. They put the pieces of the lamp on the counter and waited for the owner to come out. When he did, he brought with him the insides of a miniature portable radio, which he was tinkering at with a small screwdriver. He looked at the wrinkled, battered lamp base, and then at Douglas.

"We'd like to get this fixed," Douglas said. "The top came off."

The man put his screwdriver over one ear and, with his free hand, picked up the light cord, and then the socket. "You mean it *blew* off," he said. "You had a lousy connection there."

"I know," Douglas said tightly. "That's why we'd like a good one."

The man picked up the base, rattled it, and peered into the small hole in the top. "How you expect to get the tube out?" he said. "You can't put the socket on unless you can screw it to the tube."

"That's what we're here for," Douglas replied. "That's what we'd like you to do."

The man rattled the base again, and put it down. "It wouldn't be worth it," he said. "I'd hafta take the whole base apart to get the tube out, just so's I could screw the socket onto it. Better you should get a new lamp." He took the screwdriver off his ear and adjusted something in the radio.

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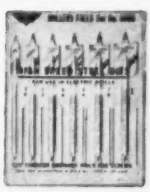

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"The top wasn't screwed onto the tube," David said, in a small voice. "It was just stuck on."

"And that's why it come off," said the man. "You gotta screw it on tight, but there's no way you can do it without you take the whole lousy lamp apart. You'd save a lot of money if you'd just buy a good lamp."

Douglas picked the pieces up from the counter. "Thank you very much," he said, and turned away.

David followed him out of the store. "What are you going to do now?" David asked when they reached the sidewalk.

"I'm going to take this apart myself," Douglas replied. "And I'm going to put a connection on there that *nobody* will be able to break. Come on." He walked back to the apartment so fast that David had to trot to keep up with him.

From the tool drawer in the kitchen Douglas took a hammer, a screwdriver, and a knife. He sat down at the kitchen table and, with David watching silently, picked up the base of the lamp. "All right," Douglas said. "Here we go."

With the knife, he scraped the base until most of the foil was off and the slats underneath were revealed. "So far, so good," he said. "Now for the next step."

Marie came into the kitchen, her arms full of grocery bags. "Isn't there somewhere else you could do that?" she asked. "I'm going to be starting dinner here pretty soon."

"Dinner?" Douglas said, without looking up. "We haven't even had lunch."

"You may have forgotten, but we're having people for dinner tonight," she said. "I've got to get the casserole started before I do anything else."

"Well, this won't take long," Douglas said. "Just till we get at this pipe, or tube, or whatever it is we've got in here."

He was aware that David was holding his breath as he put the tip of the screwdriver between one slat and the top and gave it a tap. Nothing happened, and Douglas tapped harder and then pressed down, and the slat split down the middle, with a sharp crack. There was a silence.

"That's all right," David said, at last.

"I can fix it," said Douglas hurriedly. "I can glue it together."

David said nothing, and Douglas worked carefully with the screwdriver, trying to pry the broken slat loose. But the glue was as strong as the wood, and Douglas succeeded only in splitting two more slats before he had made a space big enough to let him reach inside and take out the pipe. "I'll get some more wood and make new slats," he said. "It'll be stronger that way than if I try to patch these." He looked at the pipe. "Now," he said. "The wire went through this, and up into the socket. Right?"

David nodded. "Uh-huh," he said. He was looking at the lamp, but his voice sounded detached, as though he were talking about something else.

"You know, I really mean it," Marie said. "I'm going to need the kitchen in almost no time."

Douglas rose and began to gather up the tools. "Come on, David," he said. "Help me take this stuff into the library, will you?"

David picked up the base and the top. "Look, Pop, why not forget it?" he said. "It really isn't worth all the trouble."

"Not on your life," said Douglas. "We're going to fix this lamp if it's the last thing we do."

They went into the library and set

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the pieces down on the coffee table. "Now, let's see what we're going to need," Douglas said. "I guess I'd better make a list." He took a pencil and a piece of paper, and said, "First off, a new pipe. With threads. Then wood, and glue, sandpaper, foil . . . Now. Is there anything else?"

"The shade," said David.

"Of course. A shade." Douglas finished the list, put it in his pocket, and said, "We're off."

As they went past the kitchen, Marie said, "David, don't forget you've got clarinet practice to do. You didn't do any yesterday, and you're way behind on the week."

David stopped. "I guess I'd better do that," he said to Douglas. "I'll see you when you get back.' '

"All right," said Douglas. "Whatever you say. I may be gone a long time."

It took Douglas two hours to get everything he needed, and by the time he got back to the apartment Marie and David had had lunch and David had gone to the movies with a friend.

"I'm sorry we couldn't wait for you," Marie said. "But I had no idea when you were coming back."

"That's all right," Douglas said. "I'm not going to have time for any lunch anyway. I want to get this thing finished so he can use it again tonight."

He took the materials into the library, spread newspaper on the floor, and got to work. He found that without David watching him he was able to concentrate much better, and he took great pleasure in sandpapering the new slats until they fitted with the old ones, and then smoothing the whole base down to a finer finish than David had originally given it. It was not an easy job, and he admired David for having been able to do it all. He made sure that the fixture and the wiring were as tight as possible, and then he put on two layers of foil, rolling it carefully and keeping the glue spread evenly, so that when he was finished the lamp looked like a machined-metal cylinder. As an added touch, he put a piece of green felt on the bottom, instead of the foil that David had stuck there.

Douglas had bought a plain white lampshade. For decorations, he had got decalcomanias of various flags, and he applied these in a scattered pattern all over the shade. He was

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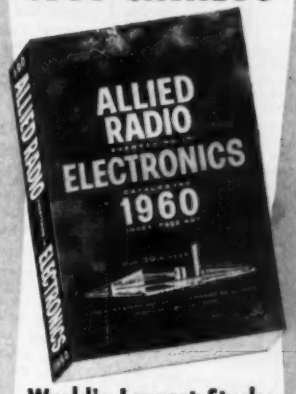

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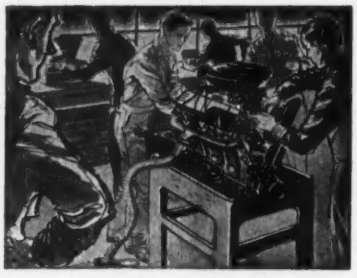

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putting on the last one when David came into the room.

"Hey, Pop, you should have seen that picture!" David said. "There was this guy, and he had invented a truth serum, only it wouldn't work on weeds, so when the monster weeds tried to take over the earth, he had to get the Cat Girl to help him. Only she was—"

"How do you like the lamp?" Douglas interrupted, holding it up for David to see.

"Hey, that's pretty good," David said. "Anyway, you should have seen this Cat Girl. She was all over hair and claws and whiskers—you should have *seen* her whiskers—and when this guy asked her to help him against the monster weeds all she could say was 'Meow.' Then, when they—"

"Here, said Douglas, handing the lamp to David. "It's all finished."

David took the lamp without looking at it. "So then you should see what happened," he said. "Next, they got a—"

"Look—I'm sorry, but I can't hear it all now," Douglas said. "It's late, and I've got to clean up and get changed. O.K.?"

"O.K.," David said, and he went down the hall to his room, carrying the lamp upside down.

When Douglas had bathed and changed, he went into the kitchen, where Marie was cooking David's supper. "Anything I can do to help?" he asked, rubbing his hands together.

"Yes, please," she said. "Tell David his supper's ready, and then get out the ice and the cocktail things. And if anybody wants me for anything, I'm in the tub."

"Right," said Douglas. He went to David's room, knocked once on the door, and opened it. "Supper's ready," he said.

"O.K.," said David. He stood up. He had been reading a comic book at his bedside table, by the light of a battered old lamp, with a bulb-browned shade, that had been in his room for years. The new lamp lay in a corner, unplugged, on top of a pile of guns and broken plastic models.

"Hey!" said Douglas as David started out of the room. "Aren't you going to use your lamp?"

David looked at the lamp in the corner. "Oh," he said. "Sure." He went back, and picked up the lamp and set it on a shelf, and plugged it into a wall socket. He turned it on

to make sure it would work, then turned it off and left the room and went into the kitchen. Douglas heard him ask, "What's for supper?"

For almost a minute, Douglas stood in the room, looking at the lamp in the darkened corner, and then he went over to it. He had put his hand on the switch to turn it on, when he stopped. "No, I guess not," he said to himself. "I guess there's really no point." He took a deep breath, and turned and walked out of the room, closing the door behind him. ★

Ferris Institute . . . *from page* 15

passes, but also for the adaptation of its programs to individual instructional needs. The physical plant of the college is virtually new since no building, with the exception of one built in 1929, is more than eight years old.

Actually, Ferris Institute is not a *new* school. It had its beginning in 1884, and is currently celebrating its 75th anniversary. Much of its unique character is attributed to its founder, Woodbridge Nathan Ferris, who established the school as a private institute and stressed "practical" and "vocational" offerings Shortly after the State of Michigan took over the school in 1950 from the Ferris family, a fire leveled the entire school except for a section of one brick structure. Almost immediately the State of Michigan began replacing the ruins with modern buildings — a process which has gone on uninterrupted for seven years. At no time since 1950 has there been a period without some building construction in process, or in which student enrolment has not increased, or when the faculty has not grown in size and stature. The Ferris Institute Board of Control and its president, Dr. Victor F. Spathelf, have adhered to the basic philosophy on which the school was established — a tribute to the educational foresight of its founder.

Educators should feel heartened by the success and growth of the trade-and-industrial program at Ferris, and particularly because of its acceptance by industry. It proves that industrial-vocational education is, indeed, a vital part of the American educational program. ★

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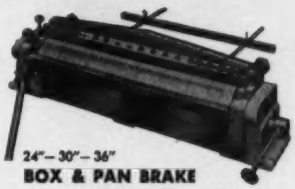

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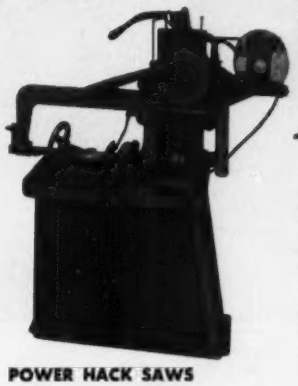

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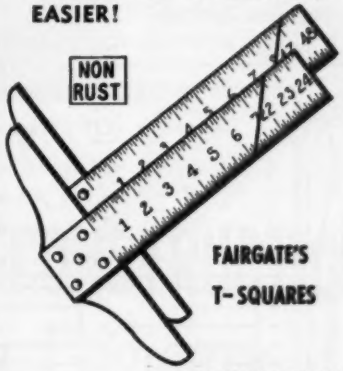

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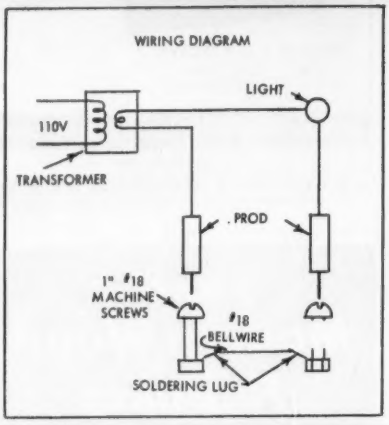
It's a learning game

Measuring: Basis for Shop Work

By James S. Dickson and Al Ulrich

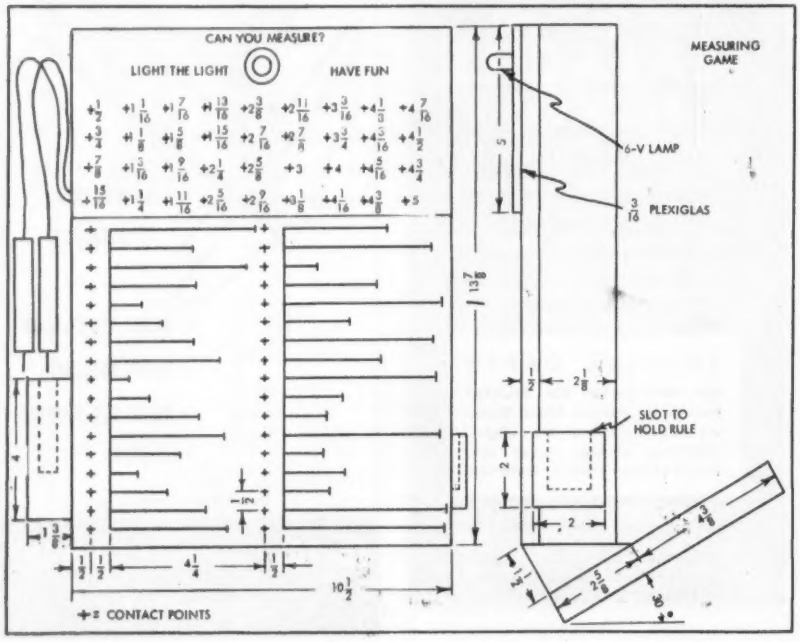
Woodshop Instructor and Student, respectively, Perry High School, Pittsburgh, Pennsylvania

A student playing and learning while using the measuring device described here in words and pictures. Two students can use it at one time, both learning simultaneously.



SOME of the smarter chaps who have entered our wood shop knew how to measure before they stepped over the threshold. Most of the remaining boys were able to learn measuring in a few lessons. But the slow learners were a problem. Should we have held the large majority of the class back, or should we have forgotten slow learners?

I think it is obvious that we had to teach every boy to measure. Measuring is as fundamental to shop work as water is to a duck.

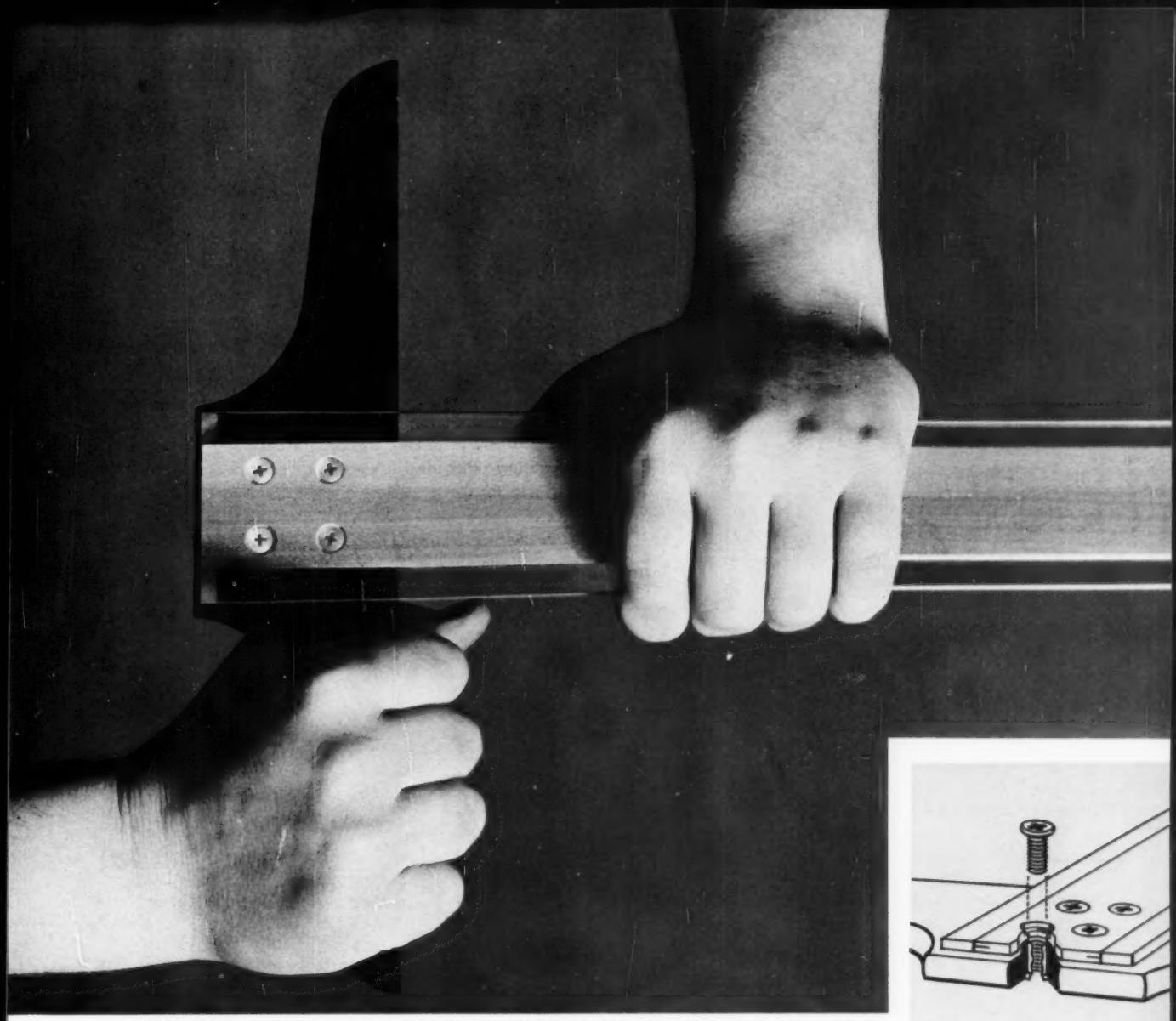


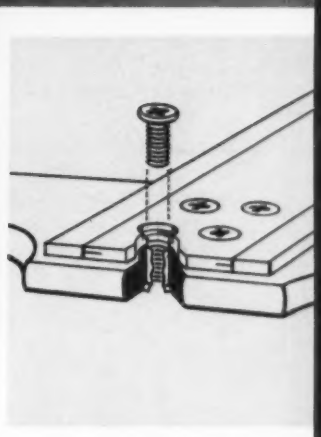
We devised a game that we use to work with our slower boys. It is fun as well as educational, and futhermore, youngsters learn with it without the guidance and presence of the teacher.

The rules are simple. Referring to the drawing, first pick up a rule and measure the length of the first line. Measure it from the vertical line on the left to the short vertical line at the right. (Note there are two columns of lines to be measured.) Place one prod on the screw head to the left of the line just measured. Place the other prod on the screw head to the left of the "correct" measurement at the top of the game. If the correct screwhead (above) is touched with a prod, a light signal turns on, indicating the measuring has been done correctly.

Directly above the game we have placed an enlarged section of a rule. Each of the fractional divisions is enlarged and noted. This is a handy check for a youngster to use to determine proper reading of fractions on a regular rule.

Repetition is the key to this teaching aid. Two boys can work together with it, making the device an even more efficient aid. ★





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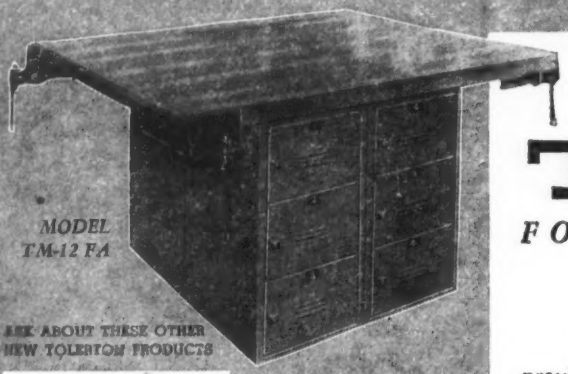

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News ABOUT TRAINING

The Technician

School Shop Offers New Feature

BEGINNING with this issue, SCHOOL SHOP will bring to you a news section dealing with new developments in the field of technician education. The passage of the 1958 National Defense Education Act by Congress, with Title VIII giving financial support to the states for technician education, has aroused great interest in this neglected phase of education. In addition, the special April 1959 issue of SCHOOL SHOP, devoted to this topic, brought many requests for further information and editorial coverage of one of the fastest growing areas of education. We welcome items for this section which will be carried at regular intervals. Address them to *The Editor*, SCHOOL SHOP, 330 *Thompson Street, Ann Arbor, Michigan.*

Improvements Needed

A PLEA for a greater degree of cooperation and understanding between technical institutes and industry was made by B. C. Boulton of the McDonnell Aircraft Corporation at a meeting of the Technical Institute Division, American Society for Engineering Education at the University of Pittsburgh in June.

Mr. Boulton expressed his belief that the standards of many technical institutes must be raised and there must be more uniformity in the courses and amount of work required.

"There is confusion in industry between junior-college graduates and technical-institute graduates, and there is also lack of understanding of the distinction between a technician and one with an Associate Engineering degree and the type of work for which each group is fitted," he said. "The aircraft industry can effectively use and needs a considerable number of well trained technical-institute graduates. They are capable of doing a large variety of work now assigned to four-year graduates and hence can relieve any existing engineering shortage."

Many companies, especially top managements, he pointed out, do not realize how technical-institute graduates can be effectively utilized and prefer to hire four-year graduates. An education program is needed to correct this situation, he said. In Mr. Boulton's opinion, the attitude of many companies in looking askance at men with two-year certificates, even though they are fully capable of doing much of the work required, results in an unbalanced organization and is one of the causes for both an engineering shortage and for frustration of four-year graduates.

"There is a tendency for technical-institute graduates, working with university graduates, to undertake work for which they are not prepared and to become discontented if they do not advance as far and as fast as the four-year men," he said. "This is not good and can be a detriment to their employment."

Mr. Boulton declared that for the first two years of employment in certain areas, technical-institute graduates tend to be definitely superior to four-year graduates and hence are

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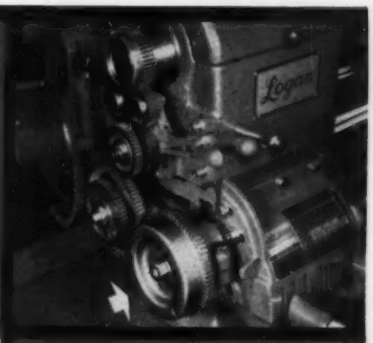

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quite happy. After this period, unless they supplement their original education, they often find their progress blocked, and hence are apt to develop a feeling of frustration. However, an institute graduate of unusual ability and character, who after employment in industry continues his studies at a university, can advance to high positions, he said.

In discussing the improvement of technician training, Mr. Boulton offered the following:

Much more stringent requirements should be set up for accreditation so that all accredited technical institutes will be as satisfactory as the better ones are today.

Strenuous effort should be made to improve the educational standards required for technical-institute faculties.

Technical institutes not having good shop, laboratory, and library facilities should be required to improve them in order to secure accreditation.

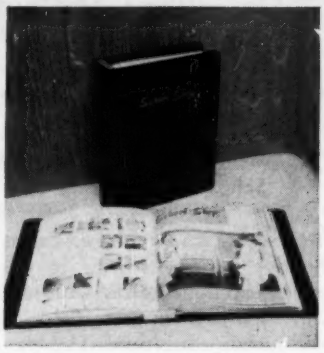
Much more precise and standardized catalogs and course titles and descriptions should be required from technical institutes.

Mr. Boulton announced that the American Society for Engineering Education has established a committee to make a re-evaluation of technical institutes and to prepare recommendations for accreditation that will have real significance. One of the principal aims of the committee is to secure minimum hard-core curriculums which will insure adequate preparation of graduates in their respective fields, he said. The aim is not to secure dead uniformity, he declared, pointing out that distinctiveness can be achieved by exeeding minimum requirements, by varying the emphasis, and by developing superior staff and facilities.

"Industry wants technical-institute graduates who have practical knowledge and skills which can be quickly utilized," he said. "This is the major advantage that these graduates have over graduates from four-year courses. Industry does not want technical-institute graduates who endeavor to prepare for the same work as college men at the expense of practical shop, laboratory, or drafting experience."

School-Industry Cooperation

To HELP train electronic technicians, Phoenix High School, Ariz., was recently given several thousand dollars worth of training aids by the elec-



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tronic technician divisions of General Electric Corporation and Motorola Corporation of that city. Included were mock-ups, printed circuits, breadboard designs, new transformers, transistors, resistors, diodes, and wiring. The companies stated that this material, the same as used in their plants, had been recommended by their advisory boards as usable in training electronic technicians so that training could be geared to the actual needs of the local electronics industry.

Minnesota Starts Tech Training

TRAINING for technicians under the National Defense Education Act has started in Minnesota, with the first area of concentration being electronic-technician training.

The need for electronic technicians in Minnesota was emphasized by a recent Department of Employment survey which revealed that 4,000 new electronic-technician jobs will develop in the Minneapolis-St.Paul area alone in the next five years. Most of these jobs will be with firms that regularly work on defense contracts.

It is expected that most technician training under The National Defense Education Act in Minnesota will be carried on in the state's eight area vocational-technical schools. New locations for area schools are also being considered.

Plans are now underway to evaluate and elevate two more areas of technician training – in addition to the electronic-technician training – tool-design technician and industrial-laboratory technician. St. Paul currently has two industrial-laboratory technician pilot programs in operation.

The electronic-technician program has been aided by two electronic career publications recently released by the Minnesota Department of Employment Seucurity. *An Occupational Guide* is intended for use by counselors and teachers. *Your Career Guide* is intended for use by students.

Florida State Conference

THE first Florida state-wide Conference on Technical Education, held recently in Orlando, brought together key individuals representing educational programs and industry who were concerned with the education and utilization of technicians in modern industry.

Speakers and consultants at the conference included: Seymour Wolfbein, U. S. Department of Labor; John Walsh, U. S. Office of Education; Robert Workman, Air Force Missile Test Center, Cape Canaveral; H. Walter Shaw, McGraw-Hill Book Company; and H. F. McCallick, University of Houston.

Panel discussions were held on the needs and responsibilities of technicians in Florida industry and on the current technical education high-school and post-high-school programs.

A visit to the Orlando Division of The Martin Company plant gave the conference members a first-hand look at the work of technicians in industry.

Diamond Dust

Abrasive comments from that doughty Scot, Tom Diamond, former head, Department of Vocational Education, University of Michigan, Ann Arbor.

Out of the Gutter

HENRY J. attended his state industrial-arts convention, and he returned to his home with the conviction that such meetings are tremendously worthwhile. He had visited with many of his former college chums, and com-

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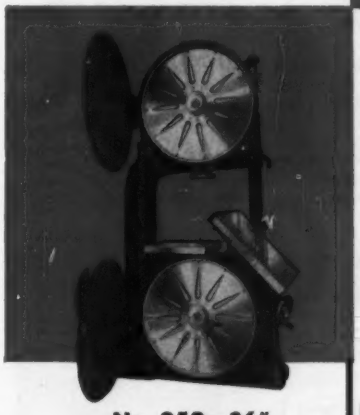

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pared notes with them in regard to their experience. He had seen, and actually handled, the latest books and equipment used in his field. And he had viewed with considerable appreciation the fine exhibit of projects displayed. He had even stumbled into a couple of meetings—by accident, it is true—and even there he was pleased to find that the speakers from his field really knew their stuff, and had made certain suggestions which he decided he could use in his teaching.

Henry had gone to the convention with an open mind, knowing not what to expect, so he was delighted to discover that it was a real educational experience. Unfortunately there was one sour note which distressed him greatly. This incident had to do with certain stories that were told which, in his opinion, had no relationship to industrial arts.

Story telling is an art which is enjoyed by most people. It goes back into antiquity, and those who have the gift of telling them well are to be admired. If we examine the field of story-telling we find that it can be divided into several categories. First we think of children's stories; we have historical stories; we have legends, handed down through the ages; and who has not heard of the ubiquitous Scot story, beloved by American and Scot alike. Added to these we have the bawdy stories, which are an annoyance to all who have a reasonable amount of selfrespect. It was to this final group to which Henry directed his humble complaint.

It appears that Henry elected to attend a luncheon meeting, organized by a certain group of teachers. As the meeting proceeded he was distressed to find that, even in a professional group, there are those who violate the principles of decency by descending into the unclean depths of their unprofessional minds. If they had reserved their recitals to the latrine, or even to the hotel lobby, Henry might have forgiven them.

The speaker at the meeting discussed a topic which was both interesting and profitable, and which was sufficiently noteworthy to appeal to all who were present. However, the chairman seemed to feel that it was his responsibility to entertain the group. This he attempted to do by telling some stories which were off-color. While there were some whose minds appeared to be attuned to the lower levels of male conversation, there were others, including Henry, who felt that the stories were not appropriate for the occasion.

Henry is a broadminded citizen who is willing to admit that situations arise where smutty stories may be appropriate, but he hastens to add that he knows of none. He believes that stories are useful for illustrating a point in a speech, but they should be clean.

The individual who annoyed Henry is a smart young fellow, but he has much to learn about the fitness of things when addressing public groups. It is an admirable quality to be able to express openly what one has in his mind, but he must remember that occasions arise when this is not in good taste.

We make no apology for raising a question which is not popular in educational literature. However, we feel that similar cases arise with sufficient frequency to warrant Henry's attitude. Let us resolve, therefore, that henceforth we will eschew the use of questionable stories when we have the privilege of addressing a professional meeting. ★

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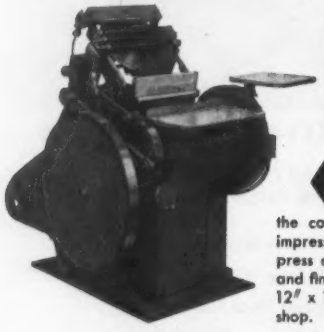

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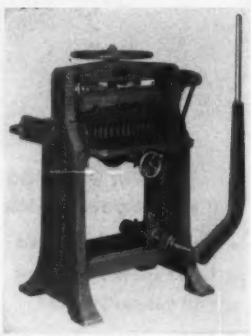

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happenings in industrial education

Council of Supervisors

M. J. RULEY, supervisor at Tulsa, Okla., is the new president of the American Council of Supervisors of the American Industrial Arts Association. Robert L. Woodward, California State Department of Education, is vice-president, and Merrill C. Hamburg, Detroit, is secretary-treasurer.

Printing Scholarships

FOUR of the nine graphic-arts scholarships awarded this year by the National Scholarship Trust Fund of the Education Council of the Graphic Arts Industry were to boys from New York state. Two were from California, and one each from Arizona, Michigan, and Illinois.

The winners and their scholarships are: Clinton G. Anglin, Tucson, Ariz., the Elmer G. Voight Craftsmen Educational Trust Scholarship to Carnegie Institute of Technology; David P. Hull, Grand Rapids, Mich., the Edward I. Miller Manhattan School of Printing Scholarship to Carnegie Institute of Technology; Robert J. Jankowski, Van Etten, N. Y., the A. Stull Harris Memorial Scholarship to Rochester Institute of Technology; Alfred R. Klinke, Palo Alto, Calif., the Crown Zellerbach Foundation Scholarship to Carnegie Institute of Technology; William O. Kiefer, Queens Village, N. Y., the Sorg Printing Company, Inc. Scholarship to Rochester Institute of Technology; Paul J. Levy, New York City, the Blanchard Press Scholarship to Rochester Institute of Technology; John A. McHenry, Buffalo, N. Y., the Kurt E. Volk Scholarship to Rochester Institute of Technology; William W. McKnight, Normal, Ill., the George M. Cornelius Memorial Scholarship to Carnegie Institute of Technology; and James J. Kitchen, San Bernardino, Calif., the Jacob Korsen Memorial Scholarship to Los Angeles State College of Applied Arts and Sciences.

Twenty printing teachers also were awarded Elmer G. Voight scholarships to attend the annual conference on printing education at the University of Colorado in July. These winners were:

Oliver J. Agerlie, Richfield, Minn.;

NOISELESS, SHOCKPROOF, A. C. WELDER

IDEAL FOR CLASSROOMS... SAFE—SILENT

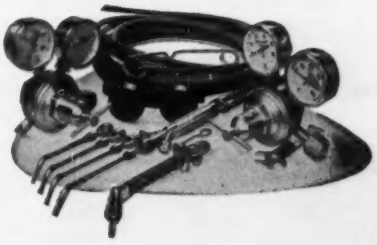
Marquette's new 90 Series Welder is best for classrooms because it is shockproof, noiseless and makes arc striking easier. Why? The welder is enclosed in tough, durable fibre-glass which is *non-conductive!* The "Perma-Shield" cabinet eliminates eddy current losses, noisy vibrations and shock-danger. This new welder is ten per cent more efficient and provides improved arc striking characteristics... advantages that teachers and students alike will welcome.

That's not all! The fibre-glass cabinet is rustproof, colorproof, waterproof and moisture proof. It's stronger than steel but lighter in weight and practically indestructible. The entire welder is best for training purposes because it's easier to operate (heat taps are clearly marked and safe, positive and easy to select), it's built to last longer and it will always keep its new appearance.

Two sizes in four models are available. One delivers a maximum of 200 amperes; the other, 275 amperes and each is available capacitor equipped, for increased power factor.

WHAT DOES ANODIZED ALUMINUM MEAN TO WELDING TORCHES?

It's new and Marquette's got it! Oxy-acetylene welding torches made of *anodized aluminum* make them 50 per cent stronger and 50 per cent lighter. Precision made, they're practically unbreakable and will stand years of rough handling. Makes them perfect for training schools. Eliminates factory service because they're equipped with fast change O-ring seals. Simply replace worn seals with new ones and the torch is ready for action in minutes time. Three models (Aero-Jet, Star-Jet and Super-Jet) are available for welding and cutting all thicknesses of metal.



WHAT KIND OF ROD DO YOU WANT?

Marquette makes a welding electrode or gas rod for every welding application. From its famous No. 130 Red Rod for getting deep penetration in dirty, rusty metal to its No. 15 Presto-Arc rod for high speed welding of sheet metal, Marquette offers the best for any shop. This range of rods includes high tensile, hard surfacing, cast iron, special alloys and bronze rods.

WRITE FOR THESE FREE FACT-PACKED BULLETINS

1 The 90 Series Arc Welder
2 Jet Series Welding Torches
3 Guide to Better Welding

When it Comes to Welding Come to

MARQUETTE
WELDING EQUIPMENT

Marquette Manufacturing Company, Inc., 307 East Hennepin Avenue

Dept. SS-99, Minneapolis 14, Minnesota

school shop case history:

ONE TORIT CYCLONE DUST COLLECTOR CLEANS 3 WOODWORKING MACHINES

Fred A. Koertge, Industrial Arts Instructor, Refugio High School, Refugio, Texas, says: "The Torit Dust Collector is very efficient, not noisy, and is very clean. The three machines serviced are a 20" planer, 20" band saw, and 10" jointer. There are gates in the pipeline at each machine and they can be opened or closed separately."

Check other school shop instructors—check health officials and maintenance experts: they'll all tell you that dust and air-borne debris are a very real menace. The answer is low cost, high efficiency Torit Dust Collectors, in either cyclone or cabinet models. They install *anywhere*—and they belong *everywhere* dust is a problem.

Write: Educational Department

TORIT
MANUFACTURING COMPANY
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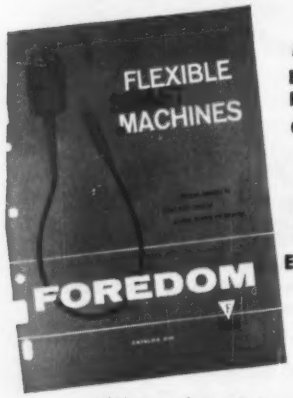
the world's most versatile tools!



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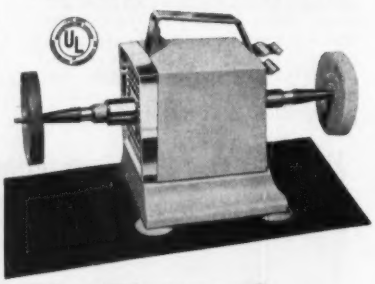


New **Dremel FLEX-O-TOOL**

Not a bulky, professional jewelers' lathe — but a compact, high quality unit engineered safe for student use. Designed specifically for the copper enameling field. Eliminates time consuming hand work. Ideal speed of 3,450 RPM quickly removes excess enamel and fire scale. Polishes and buffs to a gleaming finish in seconds.

Portable, too — weighs only 6½ lbs. Has vacuum suction cups — can be set up anywhere in classroom. Equipped with lubricated for life *ball bearings.*

MODEL 60-2 FLEX-O-TOOL. Includes two tapered spindles.
(Polishing wheels extra) $27.55
No. 215-C Rubberized Wheel (2½") 1.85
No. 4235 Cloth Wheel (3") 70

WRITE FOR FLEX-O-TOOL LITERATURE

DREMEL MFG. CO. Dept. 139-J, Racine, Wis.
Quality Power Tools Since 1934

W. Carlisle Anderson, San Diego, Calif.; Carles E. Davis, Los Angeles, Calif.; Frank DiGiacomo, New York, N. Y.; Donald L. Hays, Anderson, Ind.; Harold C. Hill, Detroit, Mich.; Quentin T. Hughes, Hackensack, N. J.; Stanley F. Kasprzyk, Philadelphia, Pa.; Wesley E. Ketchem, Colorado Springs, Colo.; Charles Kingsley, Tulsa, Okla.; Lester R. Lundeen, Paramont, Calif.; Walter J. Macak, Trenton, N. J.; Robert L. Miller, Defiance, Ohio; Jack Nathan, Pittsburgh, Pa.; Wallace O. Nelson, Minneapolis, Minn.; Roy C. Ritchie, Louisville, Ky.; Eugene L. Simpson, Edmond, Calif.; Robert M. Smith, Wheaton, Ill.; C. Eugene Strandberg, Turner, Kan.; and Robert W. Utke, Terre Haute, Ind.

Three to Thailand

THREE California teachers, all graduates of Fresno State College industrial-arts department, have been named members of the group going to Thailand under a University of Hawaii-Thailand contract and the Southeast Asia Treaty Organization.

The men, who will be headquartered in Bangkok, are: Curtis Lackey of Fresno City Schools, who will help with the apprenticeship program in Thailand; and Joseph Dzida of El Camino College, Torrance; and Joseph Acosta, Stockton College, who will work with prospective teachers in carpentry, auto mechanics, and diesel engines.

Virginia Council Elects

THE Virginia Council of Industrial Education Clubs has named Ralph Lewis, Annandale High School, as president of the organization for the 1959-60 school year.

Kent Clark, Danville Technical Institute, is vice-president; and Virgil Harris, Annandale High School, is secretary-treasurer.

Meeting Dates

THE Eastern Connecticut Industrial Arts Association has announced the dates for its meetings during the 1959-60 school year.

The school year's activities will start with a meeting Oct. 8 at Rockville, followed by a meeting at Coventry on Dec. 3. Spring meetings will be held on Mar. 3 and May 17, the locations still to be decided.

Advisory Board Members

NEW members of the Editorial Ad-

visory Board of SCHOOL SHOP magazine are: Albert E. Jochen, assistant commissioner of education, vocational division, New Jersey State Department of Education; William R. Mason, supervisor of industrial arts, Cleveland, Ohio; and W. D. Purvine, director of Oregon Technical Institute, Klamath Falls.

The new members, who will serve a four-year term of office, replace the retiring members: M. Ray Karnes, chairman of the department of industrial education, University of Illinois; S. Lewis Land, head of the department of industrial education, The Pennsylvania State University; and George W. Morgenroth, director of Essex County Vocational Schools, Newark, N. J.

DAR School Adds Shop

MECHANICAL arts has been added to the curriculum of the Kate Duncan Smith Daughters of the American Revolution School on Gunter Mountain, Grant, Ala.

Since its establishment in 1924 the school has stressed two basic subjects – home economics and agriculture. But with the increasing need for trained machinists, welders, electricians, etc., in the area, both for mechanization of farms and for such nearby areas as the Redstone Arsenal, school officials decided to add the shop program.

With the help of money raised by a national DAR project a year ago, a $50,000 building has been constructed and dedicated at the school for the new program. The building, although not yet fully equipped, is now being used to train men for work in industries throughout the state.

Convention Calendar

Nebraska Vocational Association, Columbus, Sept. 26.
Four-State Industrial Arts Conference, Kansas State Teachers College, Pittsburg, Oct. 9-10.
Minnesota Vocational Association, Curtis Hotel, Minneapolis, Oct. 22-23.
Iowa Industrial Education Association, Des Moines, Nov. 5-6.
Kentucky Industrial Education Association, Kentucky Hotel, Louisville, Nov. 6-7.
New England Industrial Arts Association, Taft Hotel, New Haven, Conn., Nov. 6-7.
American Vocational Association, Conrad Hilton Hotel, Chicago, Ill., Dec. 7-11.
California Industrial Education Association, Biltmore Hotel, Los Angeles, Mar. 11-12.

Heads California Convention

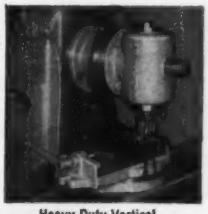
B. GORDON FUNK, supervisor of industrial arts, Los Angeles City Schools, has been named chairman of the 31st annual California Industrial Education Association convention, to be held March 11-12 in the Biltmore Hotel, Los Angeles. Don Reynolds, supervisor of trade-and-industrial education, Los Angeles City Schools, will be program chairman; and John R. Toothaker, supervisor at Pasadena City Schools, arrangements chairman.

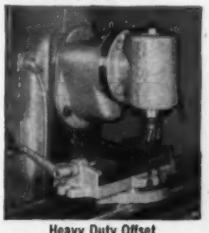
Arthur Hauler Honored

ARTHUR HAULER, chairman of the department of industrial-arts education at Teachers College at Oswego, N. Y., is the 1959 winner of the Outstanding Service Award given by the New York State Steering Committee for Industrial Arts, a section of the New York State Vocational and Practical Arts Association.

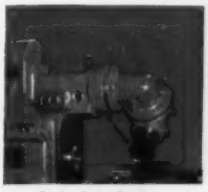
The award, given annually to the person who has made the greatest contribution to industrial arts in New York State, was made at the annual spring meeting of the Committee.

Mr. Hauler is noted for his initiation of the college's off-campus student teaching program for industrial-arts instructors. ★


Heavy Duty Vertical Milling Attachment


Heavy Duty Offset Vertical Milling Attachment

Universal Milling Attachment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Heavy duty attachments increase versatility of dependable, low-cost

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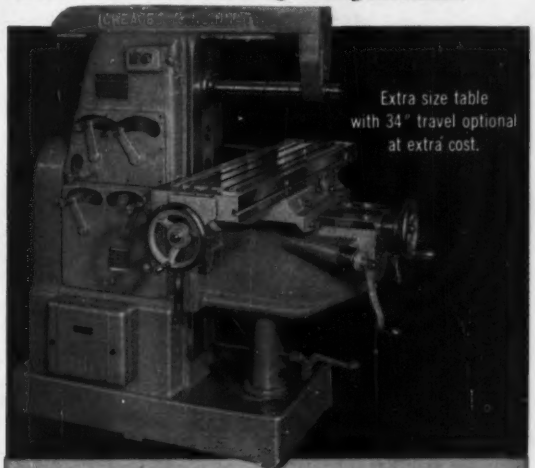
A full line of attachments and accessories offer outstanding flexibility for all types of milling operations . . . with GREAVES MILLS. Make your own comparison of 22 specifications of Greaves and 7 other leading milling machines.



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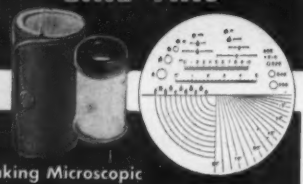

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Measure lengths, circles, angles to 1/10 mm or 1/1000" just by looking at the object. 7X magnifying eyepiece. 1 7/16" diam. x 2-11/16" long. Complete with leather case.

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ONLY **$79.00**

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COMPLETE . . with motor & switch, wired, ready-to-go.

Jefferson #601

JEFFERSON "601"

A simple, fast, accurate saw ideal for the school shop. Has cast base, heavier guide bars and guide bar support arms, Olite bearings throughout. Features include fast acting 45° swivel vise and pressure relieved back stroke. Order from your KELLER Dealer or direct.

Choose from 10 Keller Models, 4" x 4" to 10½" x 9"

Quick Acting, Positive Holding

DRILL PRESS VISE

A simple, rugged vise that sets to any angle quickly. Strong jaws 4⅛" wide x 2" deep open to 4¼". Weighs 16½ lbs. Ask your KELLER Dealer or write direct.

$11.50 F.O.B. Factory Eau Claire Wis.

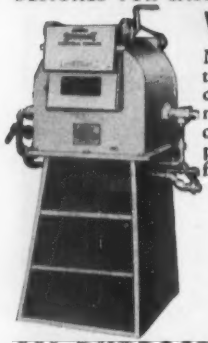
KELLER DIV.

Sales Service Mfg. Co.

2365 University Ave. **St. Paul 14C, Minn.**

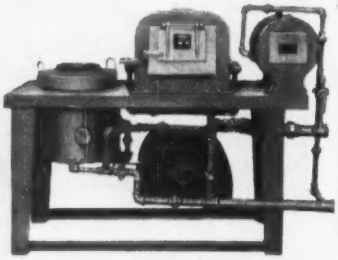
Sunbeam SCHOOL SHOP FURNACES

DESIGNED FOR EASIER INSTRUCTION—LONGER SERVICE!



WIDE RANGE OVEN

No. 128 Wide Range Oven provides wide temperature range; 300° F. to 2400° F; covers practically every phase of heat treatment. Can be used for annealing, pack carburizing, hardening, preheating, tempering and general heat treating. Ideal for general school use.



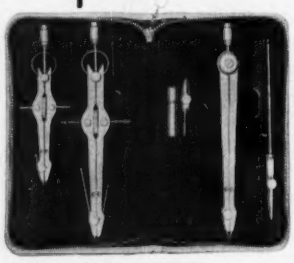
ALL PURPOSE FURNACE

Triple Purpose D, illustrated at right, is a combination pot, oven and forge furnace. Can be used for oven furnace hardening—lead, salt or cyanide hardening—lead, salt or oil tempering—forging, welding, tool dressing—annealing, normalizing, pack carburizing—non-ferrous metal melting. Also available in other combinations.

Sunbeam also builds a companion Charcoal Generator and 450°F. to 2450° F. Electric Furnaces. Information and prices sent immediately.

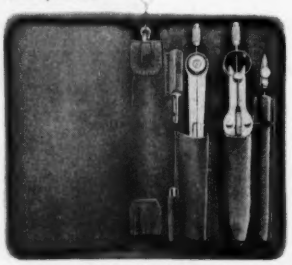
Sunbeam EQUIPMENT CORPORATION
Dept. 129, 180 Mercer Street, Meadville, Pa.

Don't sacrifice quality for economy



Illustrated: Set No. Y 171 XR

Instruments available in all combinations shown in our catalog under Set Number 171. Cover of case in either leather or a tough, durable, washable plastic.



Illustrated: Set No. Y 170 S

Pocket-type case of suedine material resembling suede leather.

VEMCO offers precision instruments at an economical price

Instruments in our more economical line have the basic VEMCO high quality construction and precision performance. They are made of nickel-plated steel and have the strength that makes VEMCO instruments outstanding. Complete catalog on request.

SPECIAL SCHOOL DISCOUNTS

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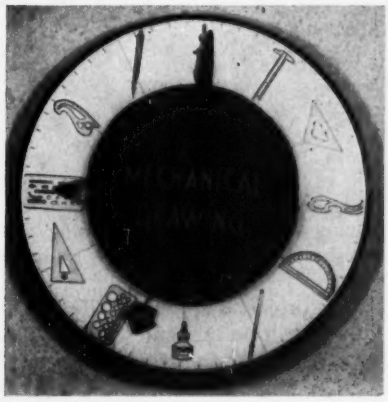
VEMCO

KINKS

Payment will be made for each Kink published. Send to Editor, School Shop, Ann Arbor, Mich.

Time for Everything

Below is a photograph of a wall clock that hangs in our mechanical-drawing room. We made it over from a discarded advertising clock – you know, the kind that advertises either soft or hard drinks.



A clock is essential to any sort of system. It indicates to the fellows when it's clean-up time, time to start a new job or process, the time interval needed to do a certain process, etc.

We redid our discarded advertising clock by making a new face out of heavy white stock and dividing the circumference into 12 parts—each 30°—and drew a small picture of a drafting tool where each of the numbers should go. Then we painted out the advertising.

These discarded advertising clocks are readily available. Just ask around. *—Herman B. Lippman, Pimlico Junior-High School, Baltimore, Md.*

Keeps Prints Tidy

The switch from blueprints to white prints in recent years has presented some problems, among them the task of keeping the prints clean and legible. Blueprints resisted grease, oil, fingerprints, etc. Not so with white prints.

Envelope-type holders for whiteprints are available, of course, if you want to spend the money for them. If you do not feel extravagant, do as we have done.

Cut red pressed board and .005" or .007" cellophane into 8¾" x 11¼" sheets or a size to fit your prints. Insert a shop print between a sheet of the pressed board and cellophane and bind the edges with 1" drafting tape.

The pressed board makes a stiff backing and the cellophane a convenient, easy-to-clean window to read the drawing through.

To change prints, remove the tape and make your substitutions. – *Alfred Grayshon, Olney High School, Philadelphia, Pa.*

A Graphic-Arts Trick

When a cheap tint background is needed for a design, paste a piece of 80-Do sandpaper on a block of wood to make it .918" high. As many as two thousand impressions have been made by this method on a Miehle vertical. It is specially good on short runs and where cost would not permit buying a metal plate to gain this effect.–*Merl L. Stuckey, Milton Hershey High School, Hershey, Pa.*

Don't Countersink

When applying plywood to boats and other articles used out of doors, do not countersink the drilled holes for the screw threads. Instead, drive the screws flush and a much tighter weather seal will result.–*C. Wayne Close, Glendale, Ore., High School.* ★

MONEY CANNOT BUY A BETTER SANDER
GET MORE QUALITY AT LOWER COST!

The rugged dependability of the JTC Sander has been proven through more than 10 years of heaviest possible use in industry, home and school shops. These sanders are rated the standard by the nation's foremost rental associations.

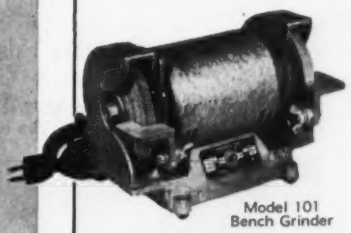
Model 300

These Sanders Are Better Because:

1. DIRECT DRIVE from motor to working surface through sealed ball bearings. No gea s or belts to wear, slip and cause trouble.
2. BALL BEARING MOTOR — constant speed induction type, 3500 RPM, no brushes or other sliding electrical contacts to fail or require service.
3. SMOOTH OPERATION — scientific counterbalance minimizes vibration, reduces operator fatigue.
4. LARGER SANDING AREA, 4½" x 7½" rubber pad does better work faster. Uses half of standard 9 x 11 abrasive sheet.

Baldwin Sanders are needed throughout the shop for finishing and polishing WOOD, METAL, FIBERGLASS, PLASTICS and OTHER MATERIAL

Model 300. Best quality only. Weighs just 6 pounds. **$37.75** The Model 200 — Extra-Heavy Duty Production Model Sander also available at $45.50



Model 101 Bench Grinder

These grinders feature the same time-tested, proven construction found in the Baldwin Sanders.

1. HEAVY-DUTY, BALL BEARING CONSTRUCTION. Constant speed induction motor, 3500 RPM.
2. SAFETY WHEEL GUARDS with scientific dust chute; removable for wire brush or cloth polishing work.
3. TWO DIAMOND-TRUED WHEELS include: 1 fine and 1 medium grit.
4. ⅜" THREADED SHAFT for driving many accessories: drill chuck, arbor, flexible shaft, sanding drum wheel, etc.

Truly outstanding value. Shipping weight 12 lbs. **$29.95** All tools guaranteed 1 year against any defective materials and workmanship.

What users say about Baldwin Tools:

From Victorville:

"The sander is for the local Jr. High School and gets awfully hard service, but of all the tools they use, these sanders are far superior to all others."

A Rental Yard Writes:

"We have rented these sanders out for 9 years; this is the first repair we've needed. These sanders are the best we've used."

Users Everywhere Say:

"Baldwin Tools do top-quality work. They are trouble-free equipment; there are none better at any price!"

YOU CAN PAY MORE . . . but you can't buy better products than BALDWIN

TO ORDER, or for further information, contact your dealer or write to:

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Please send information on:
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Students learn Best... with Highest Quality Soldering Tools

...by American Beauty

No. 3120-SC
3/16" TIP
30
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No. 3125
1/4" TIP
60
WATTS

No. 3138
3/8" TIP
100
WATTS

Shown above are some of the irons students of today will use on the jobs of tomorrow

It's smart to teach your students to use the same highest quality soldering irons that industry has used since 1894. American Beauty has the right model, with the correct tip size and proper watt input, to do any soldering job quickly, properly and efficiently. Teach your students with the best soldering irons made.

Write for 20-page illustrated catalog containing full information on our complete line of electric soldering irons—including their use and care.

AMERICAN ELECTRICAL HEATER CO.
DETROIT 2, MICHIGAN

When not in use it folds away

Clothes Hanger for Shops Lacking Lockers

By C. Weingartner

Head, Machine-Shop Department, The David Ranken, Jr., School of Mechanical Trades, St. Louis, Missouri

TAKING care of students' clothing in some of our shops and classrooms is a real problem, especially in evening school where students are not always issued an individual clothes locker.

The hanger illustrated in the pictures below (drawings on following page) was designed by the drafting department, machined as a project in the machine shop, and finally installed by the carpentry department.

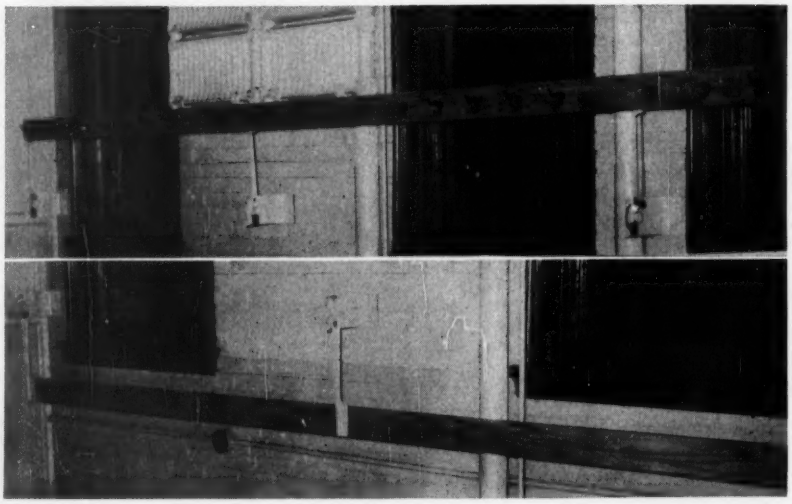
The first hanger installed has proven its satisfaction for our particular use and may be a device that can help you with your particular problem.

As you will note in the pictures, the hanger is placed in front of some windows. This was the only space available in the room. The hanger is designed to fold beneath the window during the day. In the evening the hanger is raised to its "up" position for use.

The project is not essentially a difficult one to make and consists primarily of bench work, drill-press work, and lathe work. Exact procedures for machining the parts can be determined by the equipment at hand. My only word of caution is that the holes in the arm and the bracket must be in alignment so that the lock pin will fit properly in both the "up" and "down" positions.

Three brackets were used to support a hook rail 16' long. If three brackets are used, remove the lock pin from the center bracket for ease of operation. ★

Below are two photos showing the "fold down" hanger in its two positions. The top photo shows it in position to be used. The bottom photo shows how it folds down when not used.



BILL OF MATERIALS

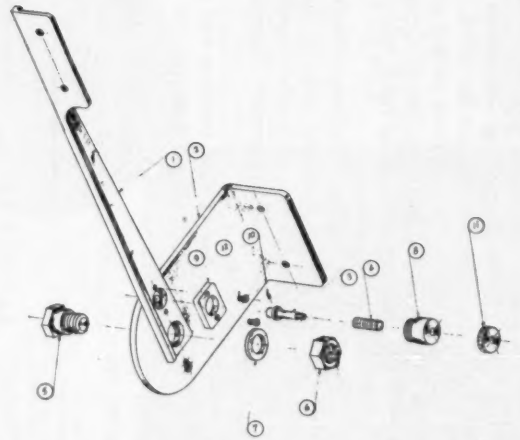
NO.	QUAN.	NAME	STOCK SIZE	MAT.
1	1	ARM-1/8 ANGLE IRC	2 X 2 X 19⅛	
2	1	BRACKET	11/16 X 5 7/8 X 9⅛	
3	1	LOCK PIN	⅜ DIA. X 1⅝ LG.	
4	1	SPRING-TO SUIT	I.D. ⅝, LOG ⅝	
5	1	BOLT	1⅛ DIA. X ⅞ LG.	
6	1	HEX. NUT	⅜-10 N.C. X 2 HVY.	
7	1	WASHER	⅜ DIA. X .09 TK.	
8	1	COVER	1⅛ DIA. X ⅛ LG.	
9	1	PLATE	1⅝ X 1 5/8 X ⅜	
10	1	ROD	⅜ DIA. X 9⅛ LG.	
11	1	CAP	1⅛ DIA. X ⅝ LG.	
12	8	FLAT HD MACH. SCR.	4-48 NF-3/16 LG.	PHOSP.

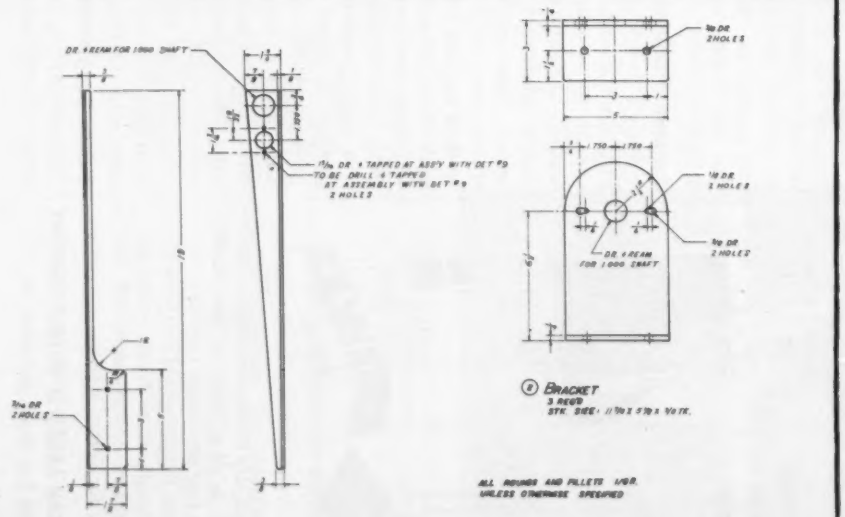
MATERIALS DETERMINED BY SHOP

POSITION WHEN IN USE

POSITION WHEN NOT IN USE

SECTION A-A FULL SCALE

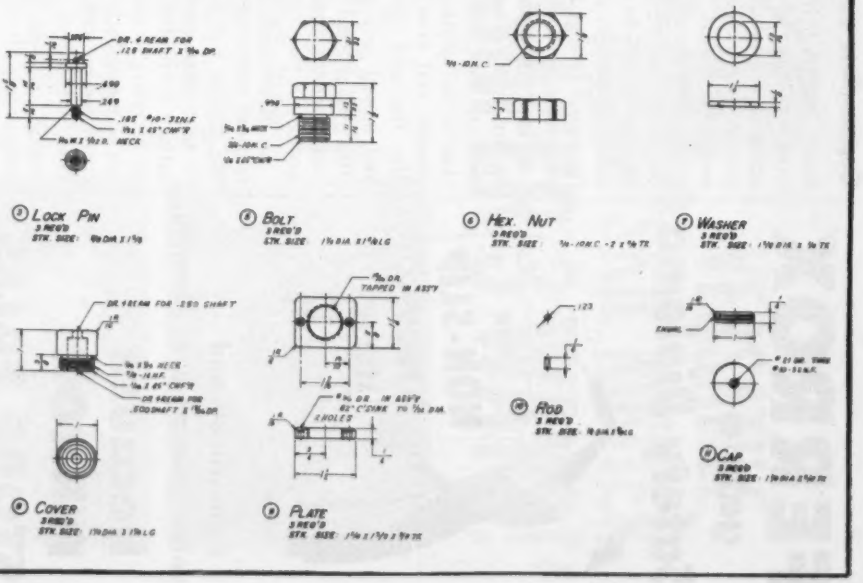



DR. & REAM FOR 1000 SHAFT
⅜ DR. & TAPPED AT ASS'Y WITH DET #9
TO BE DRILL & TAPPED AT ASSEMBLY WITH DET #9
2 HOLES
⅜ DR. 2 HOLES
DR. & REAM FOR 1.000 SHAFT
⅜ DR. 2 HOLES

① ARM
3 REQ'D
STK. SIZE: 1⅛ ANGLE 1-60# 2 X 2 X 19⅛ LG

② BRACKET
3 REQ'D
STK. SIZE: 11/16 X 5 7/8 X 9⅛ TK.

ALL ROUNDS AND FILLETS 1/8 R. UNLESS OTHERWISE SPECIFIED



③ LOCK PIN
3 REQ'D
STK. SIZE: ⅜ DIA X 1⅝

④ BOLT
3 REQ'D
STK. SIZE: 1⅛ DIA X 1⅝ LG

⑥ HEX. NUT
3 REQ'D
STK. SIZE: ⅜-10 N.C. - 2 X ⅜ TK.

⑦ WASHER
3 REQ'D
STK. SIZE: 1⅛ DIA. X ⅜ TK

⑧ COVER
3 REQ'D
STK. SIZE: 1⅛ DIA. X 1⅛ LG

⑨ PLATE
3 REQ'D
STK. SIZE: 1⅝ X 1 5/8 X ⅜ TK

⑩ ROD
3 REQ'D
STK. SIZE: ⅜ DIA X 9⅛ LG

⑪ CAP
3 REQ'D
STK. SIZE: 1⅛ DIA X ⅝ TK

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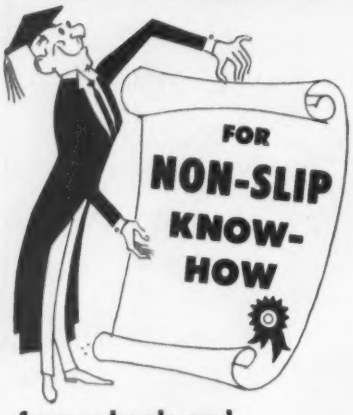

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Copperplate . . . *from page 21*

water, buffed lightly with fine steel wool, or emery cloth, and immersed again in the solution, this time with reduced amperage. If rough spots, sometimes called "orange peel," develop, these should be smoothed. This condition can be corrected by: The plating should be continued at a reduced amperage; or the work should be moved farther away from the copper anode; or both should be done.

It is desirable from time to time to agitate the solution and to move the work so that it faces another direction in the solution. This will ensure smooth and even plating. Occasionally, the work should be withdrawn and moved to a new position in its sling to prevent the formation of marks where the sling touches the work.

In nonmetallic plating, the copper will not cover the work immediately, the plating will seem to be "taking" in spots that spread until the entire surface is covered. Sometimes it may be necessary to retouch, with the copper-bronze solution, a particular spot that seems unwilling to be plated. One purpose of inspection is, of course, to ensure that plating is occurring evenly all over the surface.

Depending on the amperage and area of work, a stisfactory thickness of copper should be deposited in 2 to 4 hours. Smoother plating results can usually be obtained by using a low amperage for a long time than a high amperage for a short time.

Antique Finishing

After a copper coating of sufficient thickness has been deposited, the work should be removed from the tank, washed thoroughly in water, and buffed lightly with a soft, wire, scratch wheel (brass preferred). Although copper-plated objects can be preserved in their natural color by light buffing with rouge or a cloth buff, antique finishing tends to make them look richer and less gaudy.

Antique finishing is easily done by buffing the work with a soft, wire brush, and then immersing it into a solution of 3 ounces of liver of sulphur in one gallon of water. The work should then be washed and rubbed lightly with fine steel wool to bring out the highlights. A coat of clear lacquer will preserve both the color and the finish.

Safety Suggestions

Electroplating is not a dangerous activity in the school shop. However, care should be exercised in handling chemicals and in dealing with electricity. This is just good common sense. Some specific safety suggestions for students to follow when electroplating are:

1. Avoid getting chemicals or chemical solutions on the hands, face, or in skin breaks. Wear rubber gloves, if necessary. Keep hands clean by thoroughly washing them with soap and water.
2. Avoid inhaling fumes which may be given off during plating. Special ventilation is unnecessary in ordinary use of the equipment described herein.
3. Protect your clothing and yourself by wearing aprons (rubber preferred).
4. Avoid spilling and splashing chemical solutions. ★

Laminating . . . *from page 17*

ger from flying pieces of the hard urea resin adhesive. The members were cut to size and shaped by using a combination of operations on the jointer, circle saw, band saw, and saber saw. Special machine guards were built for some operations because of the curvilinear shape of the members. It was also necessary to design and build special jigs and fixtures to hold some members for making special cuts.

The ⅜" plated rods are pinned into the legs. Their main purpose is to strengthen the legs, but they also add to the appearance of the chair. Button-head cap screws hold the legs, arms, and back support to the ¾" plywood seat. The nuts for the button-head cap screws were set flush with the top side of the seat before the upholstery was applied. The arms, legs, and back support can be disassembled from the seat at any time.

The many and varied facets of this project provide you with some idea of the potential it has for challenging not only your better students but also the opportunity it gives you to present all of your students with a new process for fabricating. ★

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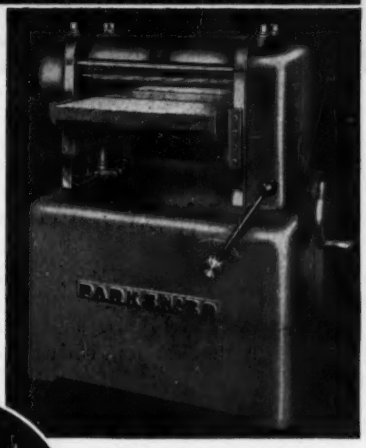

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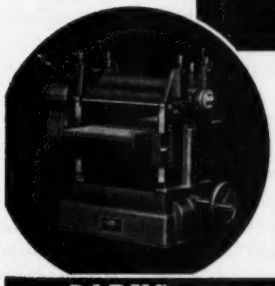

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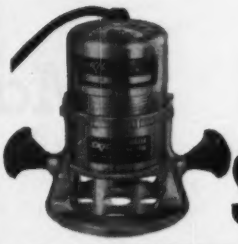

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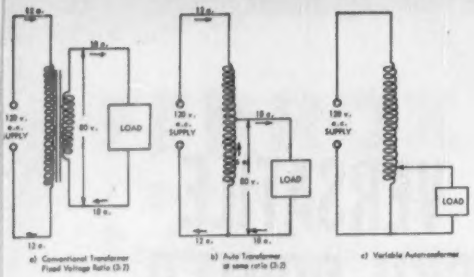


Fig. 1. Comparison of Currents and Voltages in Conventional Transformer and Autotransformer

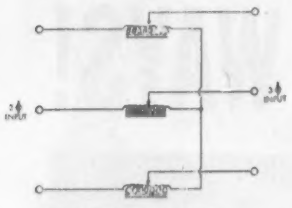


Fig. 2. Three-Phase Wye Connected Variac

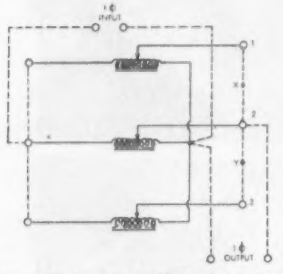


Fig. 3. Connection of Three-Phase Wye Connection to Single Phase Parallel Combination

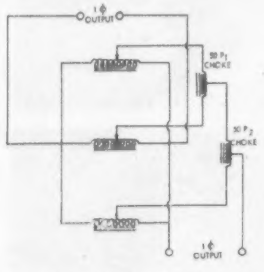


Fig. 4. Single-Phase Parallel Combination Showing Choke Connections

For the electrical-power laboratory

Make a Versatile Variac

By Irving L. Kosow

Head, Electrical Technology, Staten Island, New York, Community College

NOT too long ago I was faced with the problem of setting up the electrical and electronics laboratories in a new community college. It goes without saying that at that time technical-laboratory equipment costs were at a maximum. In addition, since the budget allocation for equipment and supplies was limited, it was necessary to exercise care in selecting equipment to make certain that both the college and the department would get the greatest value for money spent.

It was also felt that the disadvantage of making purchases during that period of high costs could be compensated for by the advantage of technological improvements in standard equipment and the emergence of new types of equipment and instrumentation previously unavailable.

Two Criterions

A basic requirement, which became rather obvious in the early planning stage, was that equipment should be made to perform two or more functions wherever possible. *Versatility of operation* and *multiplicity of function* were the criterions which, in part, determined the selection of equipment, instrumentation, and auxiliary apparatus.

It has been customary in electrical-power laboratories to provide some method for transforming alternating single-phase and polyphase line voltages to lower voltages, using some type of stepless transformation technique. One might wonder, at this point, why it should be necessary to provide a method of varying these voltages since single-phase and polyphase motors and transformers are designed to operate at *rated* line voltages. However, reduced voltage techniques may be employed to determine efficiency and regulation of transformers by means of the short-circuit test. They are also employed in measuring effective (ac) resistances of single-phase and polyphase rotating equipment. Another application is in determining starting torques of single-phase and polyphase motors at various voltages. What methods or techniques are used to obtain these voltages? Stepless transformations, generally, are provided by three types of auxiliary apparatus: the Variac, the induction regulator, and the saturable reactor.

An examination of types of apparatus available in most electrical-power laboratories for obtaining reduced voltages for the above test purposes would reveal one or more of these three types indicated. Since Variacs, induction regulators, and saturable reactors are manufactured in either single-phase or three-phase combinations, *but not both,* the average laboratory might have single-phase induction regulators for providing single-phase reduced voltages and three-phase Variacs to provide three-phase reduced voltages. The basic point, however, is this: In no case, in my experience, is there a *single* piece of apparatus which is used to supply *both* polyphase and single-phase reduced alternating voltages of *appreciable* power for test purposes. It should be noted, however, that a limited amount of single-phase power can be obtained from *any* polyphase transformation device by taking the voltage across one phase.

Back to the Realities

As pointed out previously, hard, economic realities dictated that apparatus for our school must be as versatile as possible. I rationalized that since any polyphase system could be transformed readily to single phase, and whereas any single-phase system could not be readily converted to polyphase, the obvious solution was to convert a three-phase apparatus to supply single-phase power as well; and up to its full capacity. Of the three types of stepless apparatus available, the three-phase Variac seemed the best choice.

It might be well to pause at this time to consider what a Variac is, and how it operates. Essentially, it is a variable autotransformer. An autotransformer is defined as a transformer in which part of the winding is common to both the primary and secondary circuits. As with conventional transformers, the autotransformer transfers electrical energy from one circuit to another at a remarkably high efficiency; and, in the same way, the autotransformer is used to

receive energy at one voltage and to deliver energy at another voltage. Like the conventional transformer, the autotransformer can be used to transform voltages from high to low and from low to high, economically.

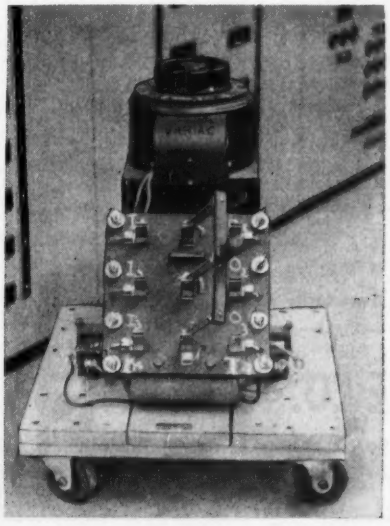
A comparison of voltages and currents (at a given instantaneous polarity) is shown in Figs. 1 (*a*) and (*b*) for the conventional transformer and autotransformer. Note that the current carried by the autotransformer winding is never as great as the current drawn by (and delivered to) the load, as is the case in the conventional transformer. Because of this there is a considerable saving in copper (and in iron) in the autotransformer over the conventional transformer.

The variable autotransformer, or Variac, is shown in Fig. 1 (*c*). Although it may appear to be a simple voltage divider, such is not the case. The voltage divider, or potentiometer, reduces voltage because of voltage drop across its elements. Consequently, a great deal of power is wasted in heat loss, whereas the autotransformer transfers practically all of the power from one circuit to another.

It is because of this that, for the same KVA rating, the three-phase Variac, is shown in Fig. 1 (*c*). Alphase-induction regulator or the saturable reactor.

The three-phase Variac requires fewer connections for operation, and, unlike the saturable reactor, requires no auxiliary d-c power source for its operation. In addition, an examination of the wiring diagram reveals that its three-phase wye connection

The versatile Variac described in the article. Note it sits on platform that has casters.



(Fig. 2) is easily convertible to a parallel single-phase connection (Fig. 3). The dotted lines of Fig. 2 represent additional wiring required.

One difficulty remained to be resolved. This difficulty is inherent in the design and construction of a three-phase Variac. The type of Variac selcted for conversion purposes was the ganged Variac type manufactured by the General Radio Company. As shown (below) this unit consists of three single-phase Variacs, mounted vertically—one on top of the other—having a common shaft controlled by a single knob at the top. As may be seen from the wiring diagram (Fig. 3) when connected in the single-phase parallel combination, it is essential that the brushes (which bear on the Variac commutator surface) of each Variac are mechanically adjusted so that the instantaneous potential at each brush is identical. Any mechanical difference in position between these brushes, however slight, would result in a potential difference between points 1, 2, and 3 of Fig. 3. This potential difference, despite its smallness, would result in large circulating currents between the Variac sections because the impedance of each Variac is relatively low. These circulating currents would seriously limit the capacity of the Variac when operated single phase, particularly in the smaller sizes.

Chokes Provided

To overcome this objection, the manufacturer has provided chokes which are installed at points X and Y (Fig. 3). The purpose of the chokes is to limit the circulating currents caused by mechanical misalignment and consequent potential difference between the Variac sections. While it may be possible to mechanically align the Variac sections so that circulating currents may be kept at a minimum, it is advisable to install the chokes which can be obtained at a nominal cost (approximately $5 each). The complete single-phase parallel-combination wiring diagram, including the chokes for three-gang operation, is shown (Fig. 4).

Some mention should be made at this point about size and capacity as they might apply to particular needs. Ganged Variacs are supplied in two-gang or three-gang combinations. Each gang, or section, is rated, nominally, at 115 v, although the maximum voltage rating is somewhat higher as will be seen later. Current

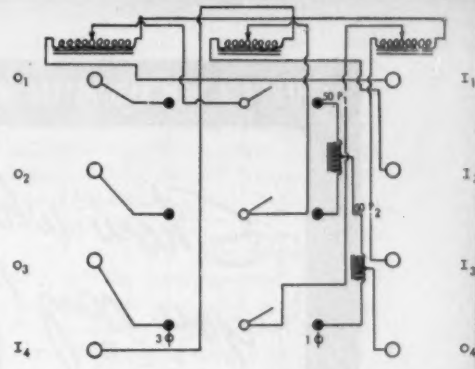


Fig. 7. Rear View of Terminal Board and Switch Wiring Connections for Three-Phase and Single-Phase Operation of Variac Assembly

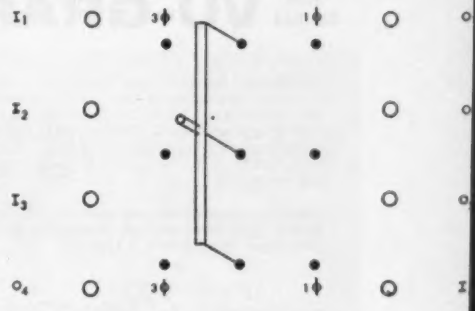


Fig. 8. Front View of Terminal Board

ratings vary from 2 amps (the smallest size obtainable), 5 amps, 10 amps, 20 amps, and up to 50 amps (the largest size obtainable). Thus, the volt-ampere ratings of available single Variac sections, or gangs, are 230 va, 575 va, 1150 va, 2300 va, and 5750 va.

Combinations Explained

Since Variacs are supplied in two-gang or three-gang sections, the customer has the advantage of a great deal of flexibility in selecting a Variac assembly to suit his particular needs. A two-gang assembly may control a three-phase load by means of the open-delta connection. When connected in this manner, the kva load rating is 1.73 times that of a single Variac. When a two-gang unit is connected as a parallel combination for single-phase operation, the load rating is twice that of a single Variac. It should be noted that a two-gang Variac would require only a single choke (type 50 P 1) for its single-phase parallel combination. The connections and switching from three-phase open-delta to single-phase operation in parallel for a two-gang Variac are so relatively simple that they are not included here.

The kva load rating of a three-gang Variac is three times that of the rating of a single Variac, in both the three-

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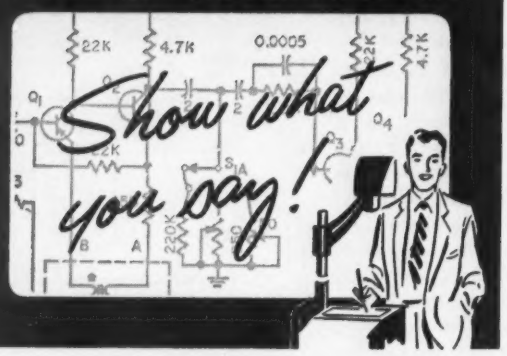

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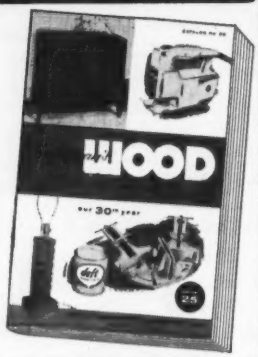

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phase wye connection and the single-phase parallel combination (Figs. 1 and 2, respectively) although the manufacturer's rating is less conservative and somewhat higher. This is because the 115-v Variac manufactured by the General Radio Company is wound for a maximum voltage rating of 135 v, to be used on a 230-v, three-phase system that has a phase voltage of 133 v. Thus, multiplying the rating by the ratio of 135/115 increases the three-phase rating from three times to 3.47 times the rating of the single Variac. It is suggested, however, that the reader use the more conservative figure, since it affords greater protection in the event of momentary overloads

A Variac for You

We come now to the factors affecting selection of a type of Variac to meet individual application. In general, selection is largely determined by an evaluation of the largest single-phase load and the largest three-phase load requiring Variac control. This evaluation is expressed in volt-amperes. A rule of thumb that might be applied in most cases to determine whether to use a two-gang or three-gang Variac follows: If the anticipated maximum three-phase load is less than the single-phase load, use a two-gang Variac. Conversely, if the anticipated three-phase load is the same, or more than, the single-phase load, use a three-gang Variac. This rule becomes rather obvious as soon as you realize that a two-gang Variac's three-phase rating is lower—in open delta—than is its single-phase rating in parallel combination. The last step in the selection process is to find the nearest commercially available size, two-gang or three-gang, to meet specific requirements. If the requirement falls somewhere in between two commercially available sizes, it is necessary to select the largest commercially available size. Perhaps an illustration, using our method of selection, will serve to clarify and refine the points outlined above.

An Example

The largest three-phase load in our power laboratory is a three-phase wound-rotor induction motor, rated at 7½ hp. The largest single-phase load contemplated at the time of making the selection was a 3-kva transformer. The three-phase motor load, at a power factor and an efficiency of 0.85 each, was approximately 8000 v-amps or 8 kva. Since the three-phase load requirement was considerably more than the single-phase requirement, we felt a three-gang Variac was needed. Consulting the manufacturer's data, the 2300-v-amp Variac, in three-gang connection (General Radio type V-20-G-3), was 7.98 kva (3.47 times the single-phase rating of 2.3 kva), conservatively rated at 6.9 kva. The next larger size was the 50-amp Variac, individually rated at 5,750 v-amps. In three-gang form (General Radio type V-50-G-3) the conservative rating (three times the single-phase rating of 5.75 kva) would be 17.25 kva. Since this value was more than twice our three-phase requirement (of 8 kva) and more than six times our single-phase needs (of 3 kva), it was decided to use the 20-amp, 2300-va size, type V-20-G-3, three-gang type (Fig. 4).

Had our single-phase requirements been a little greater, we might have considered the two-gang 50-amp size. This assembly, type V-50-G-2, open delta connected, is rated 9.9 kva, three phase and, in single-phase parallel-combination, 11.5 kva. Simple economics prohibited this choice, since it was almost twice the price of the three-gang unit decided on. Our need

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for 8-kva capacity in three phase, moreover, was rare since most of our machines were well below 5 hp.

Switch Arrangements

Having selected the size and type of Variac to be used, it remained only necessary to work out a switching arrangement that was both sufficiently understandable and simple enough, in terms of connections, to be made by students when operating the Variac. Going on the ancient adage that it is possible to design equipment that is "fool-proof but not student-proof," several switching arrangements were worked out and discarded for one reason or another.

The switching arrangement (Fig. 7) finally selected appeared to meet best the criterions expressed above and it was relatively simple to construct. The switch used was a triple-pole, double-throw, 30-amp, open-knife back-connected unit mounted on an ebony asbestos board, available from Barkelew Switch Manufacturing Corporation. The board is sufficiently large to permit mounting eight terminals (four on each side) to which various connections can be made.

Four input terminals are provided. I_1 to I_4, inclusive; so are four output terminals, 0_1 to 0_4, inclusive. To operate the Variac in either three phase or single phase, it is necessary to throw the knife switch to the proper position and to make the proper input and output connections as outlined on the terminal board in Fig. 8.

Instructions for connections are confined to three simple steps, easily checked by the instructor. Students using this and other auxiliary equipment in the laboratory are supplied with detailed supplementary informa-

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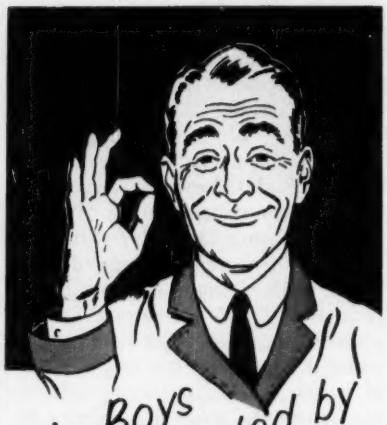

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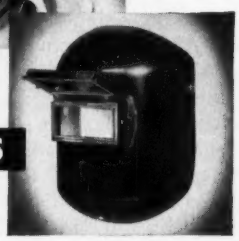

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tion sheets, showing the complete wiring diagram and explaining operation of such apparatus or equipment. To eliminate unnecessary scrambling through reference notes, the following instructions for operation have been secured to the back of the Variac for ready reference:

For Three-Phase Operation

1. Throw the switch to 3 O position.
2. Connect 208-v three-phase supply to input terminals I_1, I_2, and I_3.
3. Take variable-output three-phase voltage from terminals 0_1, 0_2, and 0_3, respectively.

For Single-Phase Operation

1. Throw switch to 1 O position.
2. Connect 120-v. input to I_3 and I_4. Connect I_1, I_2, and I_3 together.
3. Take variable-output single-phase voltage from terminals I_1 and 0_4, respectively.

The photograph of the Variac assembly consists of a terminal board, switch, terminals, chokes and Variac, all mounted on a dolly, 12" x 12", having four swivel, rubber casters. Because of its portability, simplicity of connection, and extreme versatility, we have used the Variac in various applications outside of the power laboratory, and up to its full single-phase capacity of 6.9 kva. It has been used in our electronics laboratory to control an a-c voltage piped in to all stations, maintaining it at some particular value other than 120-v ac single phase; e.g., at exactly 100-v rms to oscilloscopes for calibration purposes, or to supply moderate amounts of power at reduced voltage for certain low-voltage circuitry experiments. In our project laboratory it has been used to determine exact voltage and current required, by empirical method, to design a welding transformer. In a thermodynamics laboratory, it has been used as a stepless loading device by connecting the output of a diesel-driven alternator to the Variac input which in turn fed a resistive load bank. It can also be used as a stepless means of controlling three-phase and/or single-phase lighting, electric heaters, electric soldering devices, hotplates, etc., up to its full capacity.

And, the Cost?

The question may well be asked at this point, "How much was saved by converting a three-phase Variac for single-phase operation?"

The author recently had occasion to investigate the cost of single-phase induction regulators and saturable reactors, because we felt the laboratory should contain at least one of each of these so that students may become familiar with all prototypes of auxiliary apparatus presently in use. In sizes of approximately 7 kva, a leading manufacturer sold a single-phase induction regulator at a list price of $1200, while saturable reactors, in approximately this capacity, varied from $600 to $800, list, depending on the manufacturer. The cost of making the conversion, which includes 30-amp switches (and terminal board), two chokes, terminals, dolly, brackets, and hardware, was under $40 per unit. This $40 figure is somewhat inflated, since it would have been necessary, in any case, to have installed a terminal board and terminals for a three-phase Variac, for laboratory use.

It is my hope that this article will, in some way, focus greater attention on, and consideration of, multiple-function apparatus and equipment in planning present and future electrical laboratories. ★

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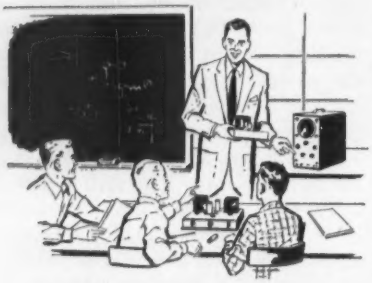

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J. EDGAR RAY, professor of industrial education and head of the department of drafting at Stout State College, Menomonie, Wis., retired in June after 45 years service at that institution. Dr. Ray, who came to Stout as a bricklayer to work on one of the campus buildings, is said to be the only union bricklayer in the U. S. with a doctor's degree. By conservative estimate, Dr. Ray has taught at least 8400 students, including the present president of the college, Verne C. Fryklund, and nearly every administrator and teacher now on Stout's industrial-education faculty.

MAURICE F. PANCOST, director of industrial arts and vocational education at Lansing, Mich., has retired. He has been succeeded by NEIL LOTTRIDGE, formerly industrial-education director at Highland Park, Mich., who has been with the International Cooperation Administration in Mexico City for the last two years.

VERNON HOECHE, formerly instructor at Wood River High School, Ill., is now a member of the faculty at Purdue University.

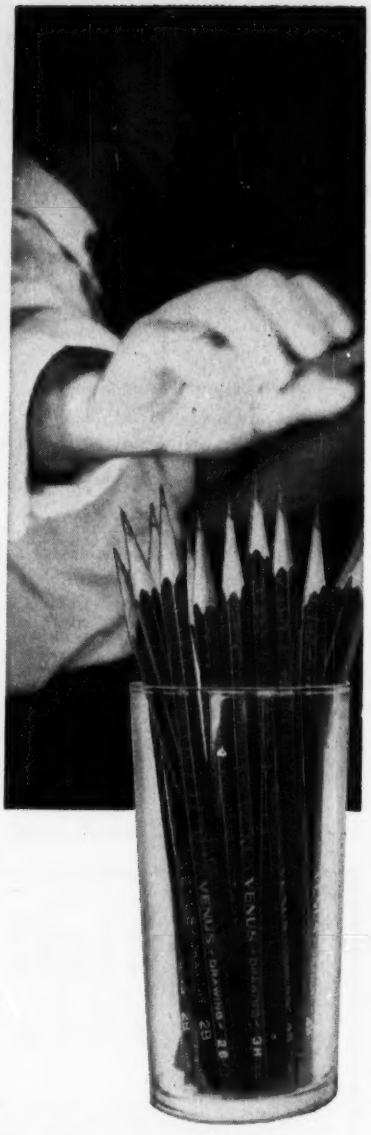
ROBERT JONES is a new member of the industrial-education faculty at Murray State College, Ky. He formerly taught at Champaign, Ill.

ELROY W. BOLLINGER, director of engineering sales and development for Airseco Associates, Long Island, N. Y., and formerly professor of industrial education for the New York State Education Department for 20 years, has been named director of industrial teacher training of the New York City Regional Center. He succeeds GILBERT C. WEAVER, who retired in June after 30 years as director.

JAMES J. GRIFFIN, formerly principal of the Park Manor Elementary School, Chicago, Ill., is now principal of Cregier Vocational High School, Chicago.

GEORGE F. HENRY, who retired in June as head of the industrial-arts department of Colorado State University, Fort Collins, after 37 years at the university, has accepted a Fulbright lectureship for a year's work in Pakistan on teacher's visual aids.

L. W. FOX, assistant superintendent in charge of vocational education and



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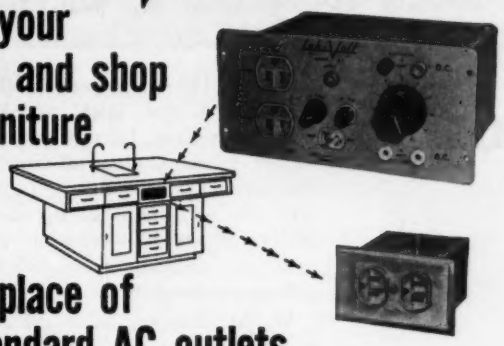

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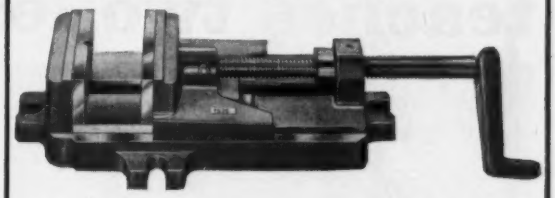

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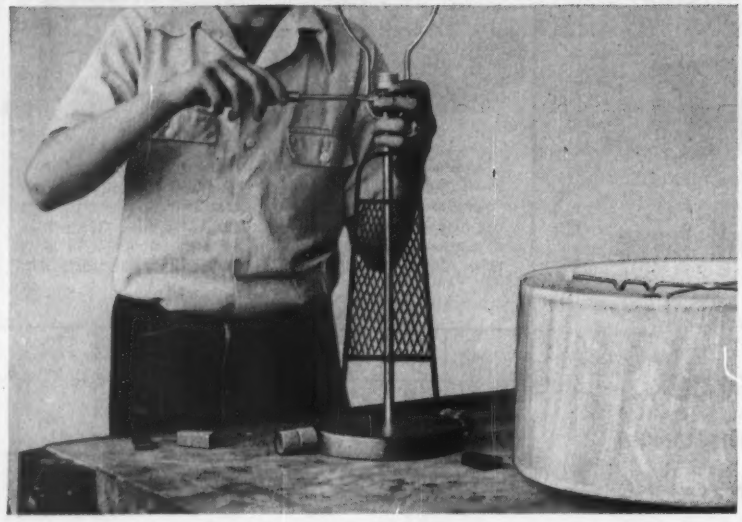

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industrial arts, San Antonio, Tex., retired in June.

JOHN J. METZ has retired as editor of *Industrial Arts and Vocational Education* after 32 years in the position.

THOMAS KING, formerly of Redford High School, Mich., and Wayne State University, Detroit, has joined Rhode Island College of Education, Providence, as professor of industrial arts. He will help set up the new undergraduate industrial-arts teacher education program at the college, the only such program in that state.

W. M. ARNOLD, state director of vocational education for Kansas, has been granted a leave of absence to accept appointment as head of the new Area Vocational Education Branch, U. S. Office of Education. J. C. WOODIN, assistant superintendent in charge of vocational and industrial-arts education, Wichita, has been named acting director.

EDWARD M. CLAUDE, state chief of trade-and-industrial education for Illinois, has been named president of the American Vocational Association for 1959-60 in a mail ballot. He succeeds H. H. LONDON.

HOYT L. MCCLURE, head of the industrial-technical department, Southern Technical Institute, Chamblee, Ga., has been named director of the Institute, succeeding LAWRENCE V. JOHNSON, who has been appointed director of the engineering extension division, Georgia Institute of Technology, Atlanta, of which Southern Technical Institute is a part.

VERD PETERSON, who retired in 1950 as South Carolina state director of vocational education, died recently in his home in Columbia, S. C., at the age of 80.

EARL BEDELL, formerly divisional director of vocational education — technical and trade schools, Detroit Public Schools, who retired in June, is now educational director, Society of Reproduction Engineers, Detroit.

ARTHUR B. WRIGLEY has retired as New Jersey state supervisor of T & I education to serve on the staff of Area Vocational Education Branch, U. S. Office of Education.

EARLE M. CASS, director of vocation education, New Castle, Pa., has retired.

WILLIAM E. WHITE, who has spent 40 years in vocational education, retired in June as principal of the H. Fletcher Brown Vocational High School, Wilmington, Del. ★

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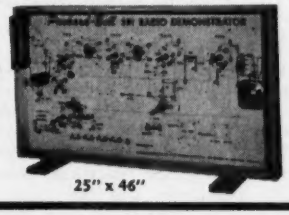

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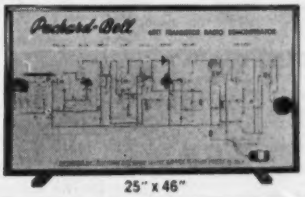

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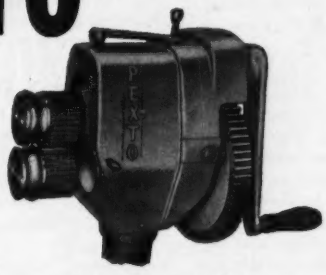

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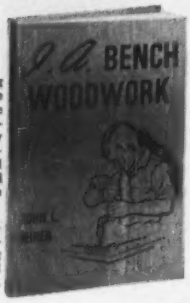

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Books:

Machine Tool Operation.—Part 1. (Fifth Edition.) Burghardt, Axelrod, and Anderson. New York: McGraw-Hill Book Co., Inc., 1959. Pp. xviii+588. $8.00.

The purpose of this text is to help the beginner learn the fundamentals of machine-tool operation. It has 20 chapters, ranging from a discussion of the machinist's trade through measuring, safety, machine work, foundry, etc.

Several actual jobs, on various machines, are explained in detail for the learner. For the experienced machinist, there are sections in which modern machine practices are discussed.

The book is designed to be used in connection with class lectures and demonstrations in the school shop.

Aaron Axelrod is a practical machinist who has a Ph.D. degree in vocational education. Henry D. Burghardt was head of machine-shop work in a Jersey City, N.J., high school. James Anderson is director of machine-shop training for the Kollsman Instrument Corporation.

Finishing Materials and Methods. (Second Edition.) Soderberg. Bloomington, Ill.: McKnight & McKnight Publishing Co., 1959. Pp. xiv+382. $4.60.

This is a revised version of a book on finishing which has long been considered a standard work in this field. This edition has included in it entirely new material on many phases of finishing such as exterior natural finishes, multicolor finishes, emulsion paint, aerosol spraying, rolling, removers, waxes, synthetic varnishes and lacquers, water repellants, and electrostatic and airless spraying.

It is a practical guide which covers in detail the finishing of various types of material. The book can be used as a textbook for classes in finishing, painting, and decorating, on a vocational level, in high schools and colleges and as a very useful reference.

George A. Soderberg is Associate Professor of Industrial Education at Stout State College, Menomonie, Wis.

Sheet Metal Shop Practice. (Second Edition.) Bruce. Chicago: American Technical Society, 1959. Pp. xii+265. $4.60.

This book has been revised and enlarged, and contains much new information and additional projects on triangulation.

This book will be of value to the beginner as well as to the experienced worker who needs a refresher. Craftsmen who have had trouble with pattern development will find the author's simple explanations helpful when they are confronted with this phase of their work.

Each operation is illustrated with drawings and photographs. Material is organized in such a manner that learning theory is a matter of summing up previously learned facts.

Leroy F. Bruce has had a wide experience as a journeyman in this trade.

Elements of Radio. (Fourth Edition.) Marcus and Marcus. New York: Prentice-Hall, Inc., 1959. Pp. xv+667. $5.25.

This is the latest edition of a book which has been popular for a number of years. The material is arranged in a manner that makes it valuable as a text.

The subject matter falls into these three general categories: electrical theory, the radio transmitter, and the radio receiver. The book is designed for a one-year course and follows the pedagogical maxim of going from the known to the unknown.

Each chapter contains a set of questions and problems, based on its contents. In addition, a complete program of classroom demonstrations is provided which should be helpful to the teacher.

The book is profusely illustrated with pictures and diagrams. The drawings are clear and have been drawn to a scale which makes them easy to read.

Experimental Electricity for Boys. Doan. New York: John F. Rider Publisher, Inc., 1959. Pp. iv+124. $3.45.

In this book experiments and construction projects are used as a means of teaching the fundamentals of electricity.

While some of the projects are suitable for younger pupils, the book is designed primarily for use in the high school. The illustrations are large and easy to follow and the instructions are geared to the level of the secondary school.

For boys who show a special interest in electricity, and who may be considering entering the field as a vocation, this book will provide an early start and make advanced study much easier.

Mechanical Design and Analysis. Slaymaker. New York: John Wiley & Sons, Inc., 1959. Pp. xiii+418. $9.50.

The author has prepared this book on the basis that a theory can be grasped more readily from the consideration of a specific case. With this in mind he has looked to the field of designing for problems that needed to be solved.

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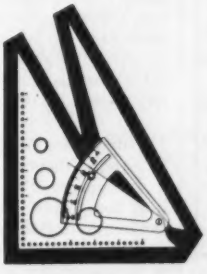

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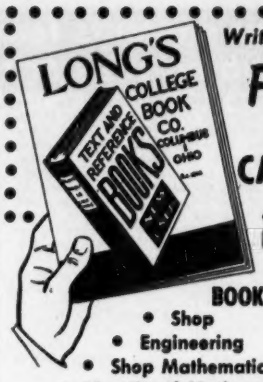

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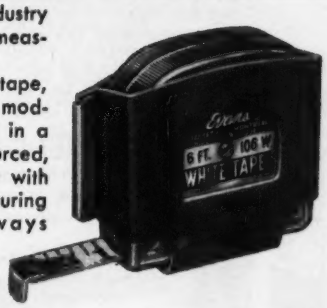

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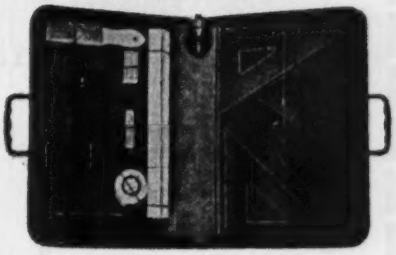

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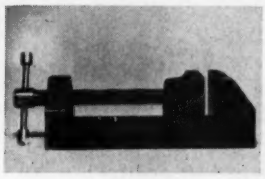

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quick-acting or continuous screw models

ground jaw faces and sides

dog is optional

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Desmond Simplex

The Desmond-Stephan Mfg. Co.
Urbana, Ohio

news from Industry

(Circle the numbers on the card in this issue to secure the items listed.)

King Electric Announces Three New Instruments

The King Electric Company has announced three new series of instruments: a silicon fast charger that comes as either a stationary or portable model; a dash-mounted tachometer (both shown below); and dash-mounted driving guides.

The silicon chargers develop 100 amps at 6 v and 60 amps at 12 v. The rectifier is hermetically sealed in ceramic to exclude moisture, acid fumes, etc. It is guaranteed for five years.

The dash-mounted tachometer is a self-contained transistor type for determining engine speeds up to 8000 rpm. The firm claims it is vibration proof and that no sending unit, tubes, vibrating relays, or dry-cell batteries are needed for its operation. It comes in three models for all 6-v or 12-v four-cylinder, six-cylinder, or eight-cylinder vehicles.

The dash-mounted driving guides are a battery-condition indicator that is said to provide a continuous indication of generator and regulator operating efficiency, and a performance gage, which is said to encourage thrifty driving by showing miles-per-gallon at all speeds and to indicate the most economical driving range.

For additional information write to the firm at 9123 Inman Ave., Cleveland 5, Ohio, mentioning SCHOOL SHOP; or *circle no. S-1 on the business-reply card.*

S. A. Hirsch Introduces Folding Legs for Tables

The S. A. Hirsch Mfg. Co., has recently introduced a folding leg that has the following features:

It is 29" high, is made of steel, has a modern tapered design, comes completely assembled ready to screw on to the table top, has an outward flare when mounting for better adjustment to floor irregularities, and is finished in a smooth, ebony-black, enamel finish.

The firm adds that the legs are particularly suitable for heavy-duty folding tables for recreation use and reduce the cost of a table by one-half.

For additional information write to the firm at 8051 N. Central Ave., Skokie, Ill., mentioning SCHOOL SHOP or *circle no. S-2 on the business-reply card.*

New Tool for Installing Camshaft Bearings Introduced

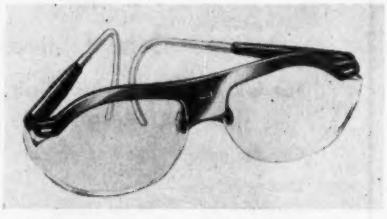
Dura-Bond Engine Parts Co., has recently introduced an improved tool for installing camshaft bearings, which, the firm states, is now available to school shops at a special discount.

The firm states, too, that the mandrels are all neoprene covered and that this covering is said to eliminate the possibility of damage to babbit bearings.

Furthermore, the company adds, speed and accuracy of installation are facilitated. Included in the tool kit are two sizes of driving bars (a third is available), four mandrels, and two expanders. A guide cone is optional.

For additional information write to the firm at P.O. Box 720, Palo Alto, Calif., mentioning SCHOOL SHOP; or *circle no. S-3 on the business-reply card.*

Watchemoket Adds Comfort to Tuc-Away Goggles



The Watchemoket Optical Company has announced that it has added new, smooth, pink plastic temple hooks as standard ear pieces on all Watchemoket Tuc-Away goggles with plastic Retrax temples.

They are said to provide greater safety, a more comfortable behind-the-ear fit, and a more attractive appearance.

The new hooks slide in and out of the temples for easy adjustment by the wearer. Once adjusted, they are said to hold firmly in place with maximum comfort and minimum pressure. One size goggle thus fits all users.

For additional information write to the

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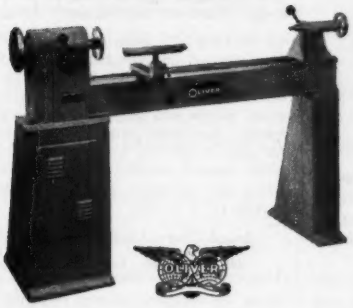

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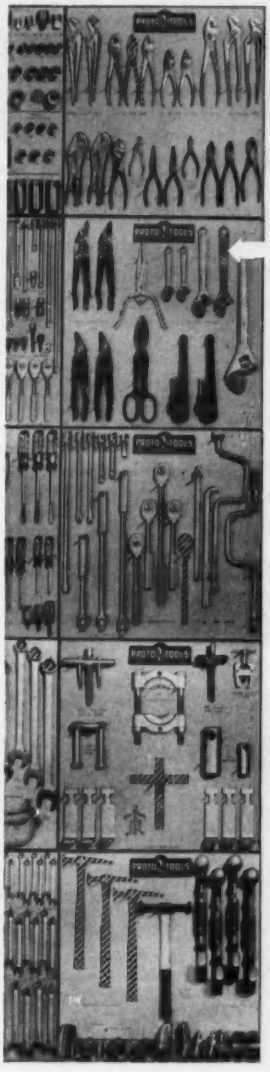

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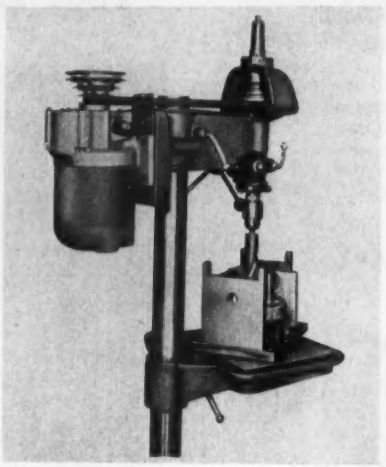
firm at 232 W. Exchange St., Providence 3, R. I., mentioning SCHOOL SHOP; or *circle no. S-4 on the business-reply card.*

Pull-Gear Doubles Machines' Capacity



The Pull-Gear Company announces that it has been able to double the capacity of light drill presses and lathe equipment by installing new motorized, quick-change, machine-speed reducers.

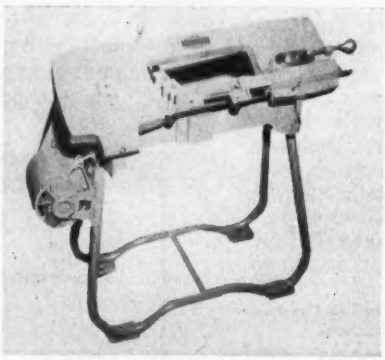
In addition to increased capacity from the greater number of machine speeds with the speed reducer, the company says the unit also provides instant changing to turning speeds slow enough for reaming, tapping, boring, and similar operations on these light-duty machines.

Original speeds of one of the firm's belt-driven drill presses was 2965, 1728, 1088, 633, and 395 rpm through a five-step V pulley. Output speeds with the ½ hp. Pull-Gear unit are 2965, 1728, 1088, 633, 395, 475, 276, 174, 106, and 63 rpm. The speed reducer also serves as a torque multiplier, permitting heavier cuts.

The new unit bolts directly to standard machine-mounting plates and the speed switching is accomplished by using a readily accessible lever.

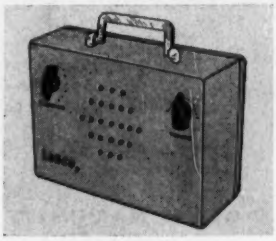
For additional information write to the company at 25425 Mound Road, Warren, Mich., mentioning SCHOOL SHOP; or *circle no. S-5 on the business-reply card.*

Metal-Cutting Band Saw Weighs only 95 Pounds



The "Excel" 3" x 6" power metal-cutting band saw manufactured by the Covel Manufacturing Company weighs only 95 pounds, the company states. Other features of the

Teach Electronics the Modern Way – Use the New IASCO 3 Transistor Radio Kit



This new speaker kit is designed as an educational electronic project. May be used at 8th grade level.

Kit consists of a good quality 4 inch speaker, 3 transistors, 1 nine volt battery and battery holder, 6 resistors, 1 variable condenser, 4 fixed condensers, 1 output transformer, 2 terminal lug strips, ferrite loop stick, plastic case with carrying handle, face plate with template and rear cover for case, connecting wire, tuning knob and selector knob, volume control, switch, 2 diodes, 1 RF choke and complete instruction sheet. List price on this kit is $22.50.

Special introductory offer only $9.95.

Kit is complete, including solder, nothing else to buy.

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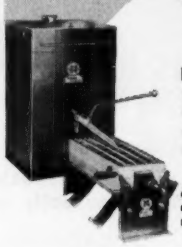

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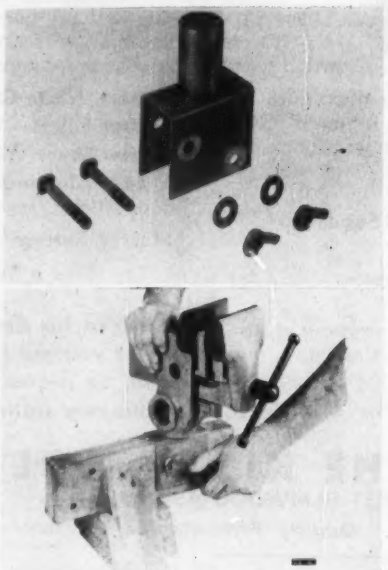
For additional information write to the firm at Benton Harbor, Mich., mentioning SCHOOL SHOP; or *circle no. S-6 on the business-reply card.*

Versa-Vise Offers Sawhorse Base



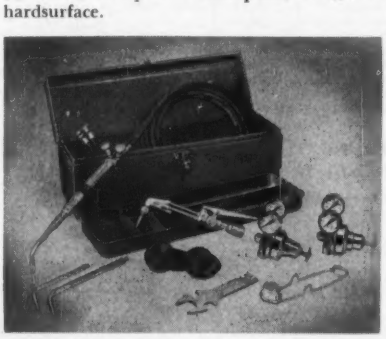
Versa-Vise has recently introduced a sawhorse base for its vise that makes it possible for carpentry students to fasten a Versa-Vise to a sawhorse at the building site, the company states.

Other conveniences mentioned by the company are: the base can easily be stored in a tool box; fits over any 2" stud, joist, or rafter; and supports the Versa Vise rigidly for every sawing or planing job.

For additional information write to Dept. SS at the company, Orrville, Ohio, mentioning SCHOOL SHOP; or *circle no. S-7 on the business-reply card.*

Airco Adds Light- and Medium-Duty Welding and Cutting Outfits

Air Reduction Company, Inc., has recently introduced a gas welding-and-cutting outfit—the Aircomite—that will weld steel up to 3/8" thick, cut up to 1" steel plate, braze, and hardsurface.



The company says that it is ideal for sheetmetal work, auto-body repair, and for

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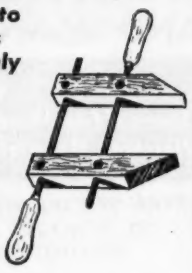

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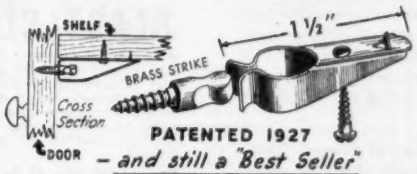

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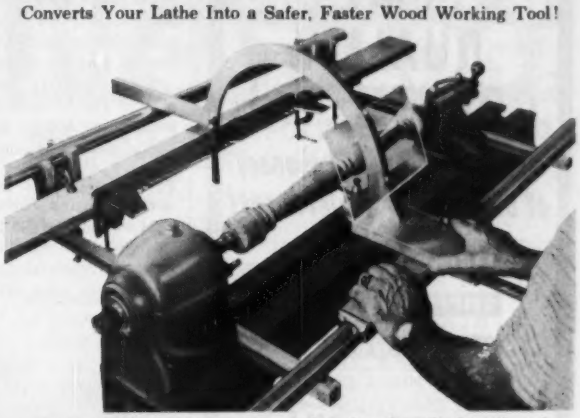

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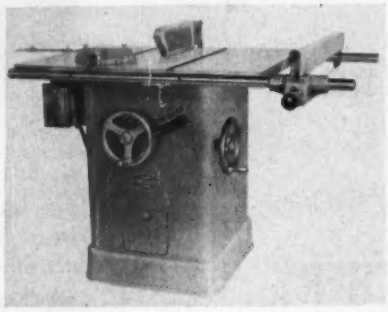
other light- and medium-duty service. The outfit includes one oxygen and one acetylene regulator, one welding torch with three tips, one cutting attachment, one pressure mixer with gas sealing rings, a pair of welding goggles, 12½′ of 3/16″ neoprene-lined twin hose with connections, one spark lighter, and one all-purpose wrench.

For additional information write to the firm at 150 E. 42nd St., New York 17, N. Y., mentioning SCHOOL SHOP; or *circle no. S-8 on the business-reply card.*

Powermatic Adds 10″ Tilting Saw with Exclusive Features

Model 65, the 10″ tilting arbor saw recently introduced by the Powermatic Machine Company has been designed with efficiency, dependability, and safety in mind, the firm states.



Claimed to be the most powerful 10″ arbor saw on the market today, the firm goes on to say that it can accommodate motors from 1½ hp to 3 hp with equal ease. The manufacturer adds that it is equipped—optional—with oversize bearings and can be driven by even bigger motors.

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For additional information write to the firm at McMinnville, Tenn., mentioning SCHOOL SHOP; or *circle no. S-9 on the business-reply card.*

New Literature:

Tools for Wood Carvers, Sculptors, Engravers is the designation of the new catalog recently released by the Frank Mittermeier Company. Profusely illustrated, the 12-page leaflet features a carving-tool chart. For additional information write to the firm at 3577 E. Tremont Ave., New York 65, N. Y., mentioning SCHOOL SHOP; or *circle no. S-10 on the business-reply card.*

Tools for Metal Cutting—The Professional Way is a five-page instructional leaflet and list of bench shears and parts published by the Bartlett Manufacturing Company. For your copy write to the firm at 3003 E. Grand Blvd., Detroit 2, Mich., mentioning SCHOOL SHOP; or *circle no. S-11* on the *business-reply card.*

The Art and Application of Copper Enameling is the new 32-page pamphlet offered by Seeley's Ceramic Service that includes 10 illustrated pages of instruction. It is offered free to schools and instructors; 25c to others. If paying for the catalog, order directly from the firm at 7 Elm St., Oneonta, N. Y., mentioning SCHOOL SHOP; *otherwise, circle no. S-12 on the business-reply card.*

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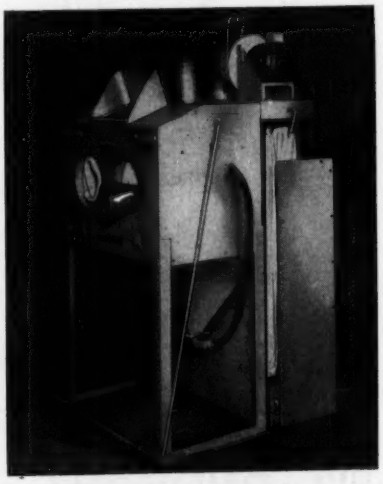

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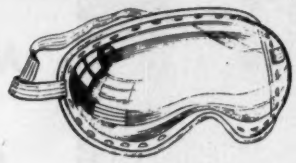
Washington . . . *from page 74*

al groups pout at the fact that Congress has assigned the task of training technicians to schools and agencies of less than college grade. And organized labor grumbles at the alleged injustice which does not permit some apprentices to attend classes organized for technicians. We mention these two criticisms to keep the record balanced as the impressive achievements of the first year's operations under Title VIII are summed up. We shall return to these real or imaginary weaknesses of the program in the future.

New Vocational Staff. – And so begins the second year of operations under Title VIII. And here it is good to report that during the summer weeks the new area vocational education branch, which will administer Title VIII, has acquired not only a new full-time head, but also six staff members. In April, only Dr. Lynn Emerson was on hand – part-time – to give help to the vocational staff regulars such as Ward Beard and Lane Ash. Dr. Emerson is still on hand as a consultant. But as the second year of operations begins, the branch has the extra services of:

Walter M. Arnold, who serves as the director of the branch. Dr. Arnold calls Pennsylvania his home state and has been a steel worker, a trade-school teacher and superintendent, a personnel manager, a businessman, a local director of vocational education, a state supervisor of industrial education (Oklahoma), and a state director of vocational education (Kansas).

C. E. Peterson, transferred from the U. S. Labor Department, where he gained recognition as an occupational analyst. This means he has the knack of looking deeply into a technical occupation, recognizing its parts, and then suggesting the kind of training that will produce that type of technician. "He's just what we've needed in vocational education for a long, long time," was the reaction to Mr. Peterson's appointment. One product of Mr. Peterson's energy is already on the table. It is a 30-page document which contains a job description of mechanical drafting and design technology, together with suggested techniques for determining courses of study for training these highly skilled technicians. Mr. Peterson plans to produce some ten such job descriptions and course-of-study outlines for training technicians in industrial



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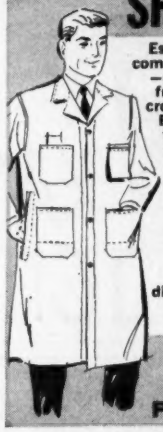

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Alexander Ducat was a local director in Troy, N. Y. His background is rich in technical education from Rochester Institute of Technology, Clarkson College of Technology, and Cornell University. In his new post Mr. Ducat will prepare documents describing the physical facilities required to train technicians in some of the same occupations which Mr. Peterson will be analyzing.

Robert M. Knoebel comes from Pennsylvania State University where he taught industrial education. In his new assignment he will help set up plans for teacher education and will be on the lookout for instructional materials in technical fields.

Frank J. Coyle, a New Yorker, knows technical education as carried on in the classroom (at Brooklyn Technical School) and as a state-wide activity, promoted by him as New York state supervisor for technical education. At the moment Mr. Coyle is preparing a guide for the development of day programs for technical training on the post-high-school level.

Arthur Wrigley, veteran educator from New Jersey, is also very much in evidence on the newly assembled staff. Mr. Wrigley's official duty is to serve as a consultant.

In addition to these men serving full time, Director Arnold also makes use of part-time specialists and people working on contract. Two examples: Wm. N. Fenninger, retired from active vocational-education service in New York, will prepare a manual on how to operate a technical high school for grades 10, 11, and 12. And the Oklahoma State University will develop an entire curriculum for training electrical and electronics technicians (ready early in 1960).

A Protest. — Is everyone satisfied with the way things have been moving under the new defense education act? We have already mentioned two dissatisfied groups, labor and the professional engineering groups. Now we mention a third — the National Council of Chief State School Officers, which represents the 50 state top school executives in Washington. When we asked the council for its estimate of the year's work under the defense act, we received the following carefully phrased statement:

"The NDEA has both good and undesirable aspects. It is providing much needed assistance to education and

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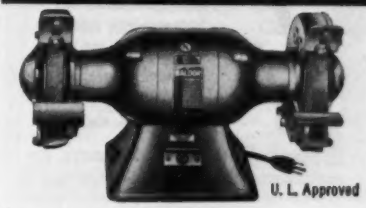

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has stimulated some excellent state and local action. But it has given an excuse for placing general educationists in regional offices of the Department of Health, Education, and Welfare and that is very undesirable."

The council was referring to the fact that the Office of Education is now appointing two educationists in each of the Department's offices in Boston, New York, Chicago, Charlottesville (Va.), Atlanta, Kansas City, Dallas, Seattle, and San Francisco.

One of these representatives will handle problems arising out of the student loans provisions under the National Defense Education Act. The other man will in effect be the agent of the U. S. Commissioner of Education in the field, will advise, consult, or help on any program in which the U. S. Office of Education has an interest — from surplus property to, shall we say, vocational education? "Well, not vocational education," comes the insistent reply from the Office of Education. "Why not vocational education?" the Council of Chief State School Officers asks, in effect. If the regional man is to represent the U. S. Commissioner of Education, isn't it possible that he'll dabble in vocational education as well as in other federal education activities?

The council has gone on record protesting the regional set-up with these words: "Any plan to establish Office of Education personnel in regional offices of the H.E.W. Department to work with state and local educational agencies will delay action, create confusion and unnecessary expense, and undermine sound federal-state relationships in education." To this the Office of Education replies, "On the contrary, it is expected that the channels of communication between the U. S. Commissioner of Education and the chief state school officers will be greatly strengthened." And so, as soon as the Office of Education can hire them, there will be placed 18 men in the Department's regional offices (salary: $12,770 to $14,000). Whether they will dabble in vocational education, create confusion, or strengthen channels of communication remains to be seen. ★

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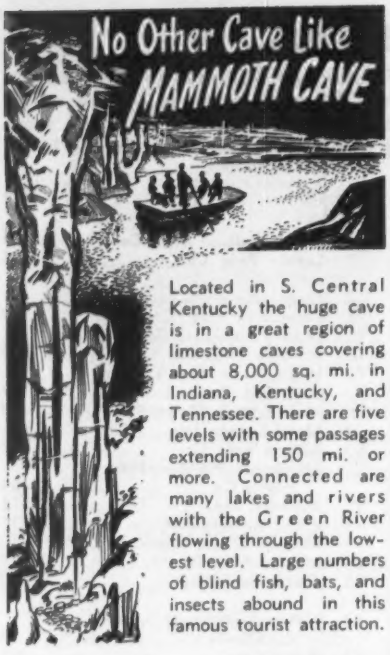
28	Chicago Mfg. & Dist. Co.	65
29	Columbian Vise & Tool Co.	55
30	Albert Constantine & Son	65
31	Craft Metals Corp.	68
32	Craftsman Wood Service Co.	50
33	C-Thru Ruler Co.	59
34	Delta Power Tool Div. Rockwell Mfg. Co.	Cov. 3
35	Desmond-Stephan Mfg. Co.	62
36	Dockson Corp.	52
37	DonJer Products Co.	72
38	DonJer Products Co.	73
39	"Dowl-It" Co.	73
40	Dremel Mfg. Co.	40
41	Dura-Bond Engine Parts Co.	53
42	EICO	30
43	Electronics Kits Supply Co.	57
44	Evans Rule Co.	61
45	Fairgate Rule Co.	31
46	J. A. Fay & Egan Co.	37
47	Foley Lumber Co.	72
48	Foredom Electric Co.	40
49	Gearon Co.	57
50	Gemaco	61
51	General Finishes Sales & Service Co.	31
52	General Scientific Equipment Co.	60
53	Gilbert & Miller, Inc.	72
54	Giles & Kendall Co.	Cov. 4
55	Gizco	67
56	Greaves Machine Tool Co.	41
57	Greenlee Tool Co.	66
58	Gyro Lamp & Shade Corp.	72
59	Hardwood Corp. of America	52
60	Heath Co.	54
62	Industrial Arts Supply Co.	64
63	Johnson Mfg. Co.	22
64	Kindt-Collins Co.	65
65	Kit Kraft	72
66	Kuempel Chime Clock Co.	72
67	J. C. Larson Co.	72
68	Logan Engineering Co.	35
69	Long's College Book Co.	60
70	Lufkin Rule Co.	28
73	Magnaflux Corp.	61
74	Marquette Mfg. Co.	39
75	Master Appliance Corp.	71
76	Mayline Mfg. Co.	50
77	McEnglevan Heat Treating & Mfg. Co.	69
78	McKnight & McKnight	59
79	Metal Supply, Inc.	71
80	Millers Falls Co.	27
81	Minnesota Woodworkers Supply Co.	64
82	Miterite, Inc.	73
83	Frank Mittermeier	71
84	Modern School Supplies	72
85	Morgan Vise Co.	74
86	Motor Book Dept.	60
87	National System of Garage Ventilation	30
88	Nolan Corp.	64
89	Old Pioneer Archery	67
90	Oliver Machinery Co.	63
91	O'Neil-Irwin Mfg. Co.	23
92	Parks Woodworking Machine Co.	47
93	Patterson Bros.	57
94	Paulson Mfg. Corp.	70
95	Peck, Stow & Wilcox Co.	57
96	Philco Tech-Rep Div.	7
97	Plastic Parts & Sales Co.	47
98	Plastic Products Co.	73
99	Porter & Dietsch, Inc.	66
100	Frederick Post Co.	33
101	G. A. Pratt Co.	72
102	Proto Tool Co.	63
103	Radio Shack Corp.	42
104	John F. Rider Publisher, Inc.	59
105	Ruemelin Mfg. Co.	68
106	Sales Service Mfg. Co.	42
107	Sax Bros., Inc.	73
108	Saxton Mfg. Co.	69
109	School Products Co.	70
110	Seeley's Ceramic Service	72
111	Sharon Bolt & Screw Co.	70
112	E. H. Sheldon Equipment Co.	8
113	Sheldon Machine Co.	51
114	Skil Corp.	47
115	South Bend Lathe Works	10
116	Southern Screw Co.	50
117	Stanley Tools	3
118	L. S. Starrett Co.	9
119	Stewart Clay Co.	70
120	Sunbeam Equipment Co.	42
121	Swenson Mfg. Co.	67
122	Telephone Eng. Co.	71
123	Tepping Studio Supply	71
124	George S. Thompson Corp.	30
125	Thos. C. Thompson Co.	72
126	Tolerton Co.	34
127	Torit Mfg. Co.	40
128	V & E Mfg. Co.	42
129	Venus Pen & Pencil Corp.	54
130	Watchemoket Optical Co.	55
131	Wells Mfg. Corp.	4
132	Western Materials Co.	67
133	Wilhold Products	71
61	Wilton Tool Mfg. Co.	5
71	Wisconsin Laboratories	68
72	X-acto, Inc.	64



Located in S. Central Kentucky the huge cave is in a great region of limestone caves covering about 8,000 sq. mi. in Indiana, Kentucky, and Tennessee. There are five levels with some passages extending 150 mi. or more. Connected are many lakes and rivers with the Green River flowing through the lowest level. Large numbers of blind fish, bats, and insects abound in this famous tourist attraction.

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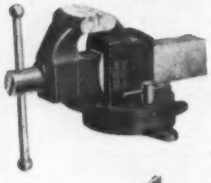

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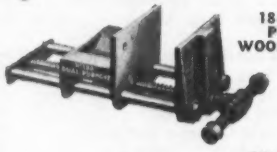
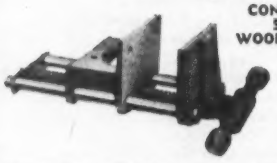


18-A DUAL PURPOSE WOODWORKING VISE



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from Washington

by Michael Paca

A Slap on the Back. — Praise and money! What more could a federal official desire when he is administering a new law? When the House Appropriations Committee voted to give the U. S. Office of Education $150,000,000 for next year's activities under the National Defense Education Act, its members added these kind words: "The Office of Education is certainly to be complimented for the expeditious way that it has inaugurated this vast and complex program."

"This vast and complex program" includes all projects launched under the ten titles of the National Defense Education Act. But the Vocational Education Division, responsible for only Title VIII (the area vocational education program), naturally comes in for a good share of the praise and some of the money. Arthur Flemming, Secretary of Health, Education, and Welfare, said that the taxpayers are getting a good return for the dollar invested in "defense education" and that he was pleased, "very much so," with the way things were going.

Well, it seems that next year taxpayers will invest $7,000,000 in federal funds for area vocational activities alone. And the way things are going there should be no trouble getting the states to accept the federal dollars and to have them matched, dollar for dollar, with state and local funds.

As a result, a kind of happy birthday feeling pervades the U. S. O. E. Vocational Education Division.

The defense education act was signed by President Eisenhower September 2, 1958. Today, one year after, federal vocational-education officials look back at their assignment under the act and feel good about the progress they've made.

Let's see what has happened during the past 12 months.

A big achievement of the year, in the opinion of James Pearson, Vocational Education Division director, is that Title VIII prompted vocational educators to do some rethinking about vocational education, where it is and where it should be going in the future. Title VIII came at the very time when rethinking was almost urgent. New products, new materials, new industries, and new occupational patterns — all had been coming thick and fast and it was high time to re-examine trade-and-industrial training programs in the light of these.

Dr. Pearson sees other achievements, too. A new respect for vocational education has come to the surface. Engineers, scientists, the armed forces, industry — these and other groups are getting to know trade-and-industrial education better. The area concept is gaining ground as school districts join hands in creating larger vocational-school service areas. And the thrust toward the 13th and 14th grade is growing in power under the impact of Title VIII.

It's been a good year for vocational education Title VIII, in the opinion of Washington officials. The states have moved faster and achieved more than could possibly have been expected. (Remember, the act was signed after the 1958 school year had all but begun.) All states, except Rhode Island and New Hampshire, submitted plans for area vocational programs. The entire first year's federal allotment of $3,750,000 available under the act was distributed to the states and, although some states have not yet used all of their first year's share, the money will soon go to work.

Good chunks of the money have already been put to work by the states to hire supervisors and other personnel; to buy equipment; to make surveys of needs for technicians. Even the fragmentary reports coming to Washington show thousands of employed persons are already in classes studying to become technicians in the critical occupations designated by the act. "The big push in enrolment is in extension classes, a push so strong as to become a trend," said one official.

All isn't sweetness and light, of course. Some scientific and profession-

(*Continued on page* 70)

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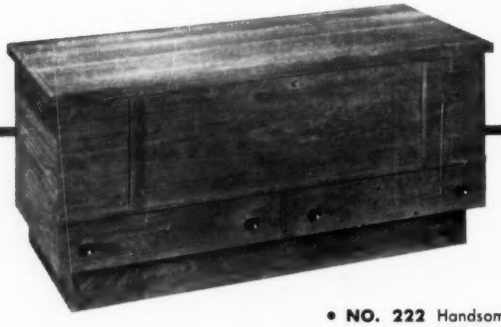

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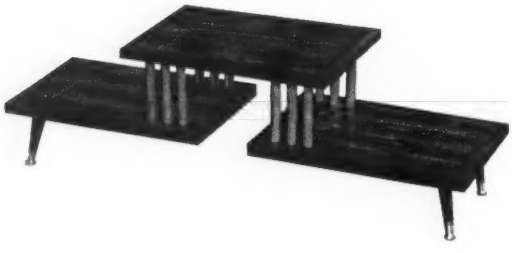

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